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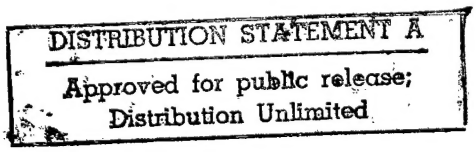

Science & Technology
Europe

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FRG: BMFT's Interim Report On Materials Research Outlined

MI890113 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 21 Dec 88 p 2

[Excerpt] Only 4 years ago, an analysis demonstrated that research and development in the FRG still did not focus sufficiently on the promising fields of ceramics, composites, new polymers, and powder metallurgy. In particular, the degree of cooperation between industry and scientific institutes was not sufficiently marked. The situation has changed fundamentally in the meantime, FRG Research Minister Riesenhuber stated during the presentation of the results of the "Materials Research Symposium" held in Hamm in September 1988 and attended by 650 participants.

Minister Riesenhuber went on to say that the BMFT's materials research program has made a considerable contribution to this improvement. The program has funded some 140 projects since 1985, of which 120 are the joint efforts of science and industry. Overall research and development expenditure on materials research projects that were initiated by 30 June 1988 totals DM940 million. The BMFT [FRG Ministry for Research and Technology] provided about DM500 million of this amount. About one-third of the total was paid to research institutes and about two-thirds to industry. The following table provides a detailed overview of the research fields that are involved:

Cost of Materials Research Projects—as of 30 June 1988, in DM Millions.

Research field	Total cost	BMFT share
Ceramics	251.0	124.4
Powder metallurgy	93.7	57.6
High temperature materials	176.0	99.5
New polymers	199.6	103.3
Composites	219.8	116.4
Total	940.1	501.2

Research Minister Riesenhuber stated that both information exchange and cooperation between research institutes and industry must be further intensified. In this way the potential of such new materials as ceramics and composites, which as yet do not follow an established route from basic research to application, can be explored for the benefit of the German economy. Special emphasis should be placed on enabling small and medium-sized companies to use the results of materials research. This is particularly true when applying R&D results. Thus, for example, FRG plastics processing firms, which make efficient use of the results of the polymer producers' large R&D investments, manufacture products with an annual value of DM39 billion (in 1987 figures). The BMFT contributes by keeping these companies constantly up-to-date about current developments with reports, seminars, and presentations at trade fairs. In 1989 the BMFT will also begin funding the establishment of five or six "demonstration centers" for fiber composite technology.

FRG: Karlsruhe University to Develop New Silicon Carbide Fibers

3698M018 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 483/484, 15 Jul 88 pp 26-27

[Text] A joint project for the production, packaging, and technical testing of silicon carbide and silicon nitride/silicon carbide fibers was started this year within the Federal Ministry for Research and Technology's materials research program. To date these fibers have been available only on foreign markets. This research project, with a total cost of DM5.3 million, is being carried out by the Institute of Chemical Engineering at Karlsruhe University, in close cooperation with a German chemical company.

Compared to traditional materials, the new fiber composites are becoming increasingly important, particularly when high stability and low weight are required simultaneously. In some sectors, plastics reinforced with glass fiber or carbon fiber are already on the market. Metallic and ceramic materials reinforced with the new fibers will be used in the future for technical applications in high-temperature sectors that no longer use polymer matrix composites and that require high-temperature resistance or special fracture- and abrasion resistance. Examples of these circumstances are primarily found in motor engineering.

The production of carbon fibers is one of the primary techniques used to produce an anorganic fiber from organic polymer materials. Japan has used a similar process for some years to produce silicon carbide fibers from an organic silicon material. The recently initiated research project will test new synthesis methods for producing the basic polymer materials that are used to produce low-cost anorganic fibers.

The development of anorganic fibers for reinforcing ceramic and metallic materials plays a key role in this area of materials research. At present eight joint projects with costs totaling approximately DM80 million are being subsidized within the materials research program, with the BMFT providing 50 percent of the funding. The goal of this project is to make a considerable improvement in the brittle fracture behavior of this interesting, high-temperature, and abrasion-resistant class of materials by introducing reinforcing elements into the ceramic matrix.

Further information can be obtained from Engineer Faul, Materials and Raw Materials Research Division, KFA-Juelich [The Juelich Nuclear Research Institute], 5170 Juelich, Tel.: 02461/614891.

New Materials Developed by French Firm

AN890072 Paris FRENCH TECHNOLOGY SURVEY in English Dec 88 p 14

[Unattributed article: "Support Materials for Working Structures"]

[Text] SEP [European Propulsion Company] has developed two materials called SEPCARBINOX and CERASEP which retain exceptional properties up to temperatures of 1800 degrees Celsius, and which are, to a very large extent, virtually unaffected by heat and mechanical cycles (vibrations, heat gradients, etc.). They are also unaffected by oxygen for the same range of temperatures and remain stable in a spatial vacuum. They are composite carbon-ceramic and ceramic-ceramic materials used for the manufacture of supports for working heat structures. Several parts have already been subjected to thermal shock tests at 1200 to 1400 degrees Celsius with a temperature increase of 440 degrees Celsius per minute. The material underwent successful compression and traction tests under extreme loads at 20, 1200, and 1400 degrees Celsius. The extreme loads applied during the tests were about 1.4 times greater than the maximum loads that will be experienced on the Hermes plane under normal service.

AEROSPACE, CIVIL AVIATION

Ariane 4 Launch of Astra 1A TV Satellite Described

36980105b Luxembourg LUXEMBURGER WORT (supplement) in German8 Dec 88 p 7

[Text] In a context of partnership cooperation, ESA, CNES [National Center for Space Studies], and Arianespace are operating one of the world's most modern rocket launch facilities in Kourou.

The Luxembourg TV satellite "Astra" is to be transported into outer space from the international space railroad station, as it were, at Kourou, in the French overseas Department of Guyana with the help of a booster rocket of the Ariane-4 type. This flight of an Ariane rocket, which bears No 27, represents the first commercial mission of the improved version of the European Ariane-4 booster rocket and is being carried under the exclusive responsibility of the Arianespace Company. The first launch of an Ariane-4 rocket took place on 15 June and was successful all the way as a result of the smooth release of three satellites all at once.

Moments of Decisive Importance—The Individual Stages of the Launch Timetable

The term "launch timetable" to the expert includes all operations required for the definite preparation of the booster rocket, the satellites, as well as the launch ramp and it is only the smooth handling of these operations that permits the ignition of the engines at the selected launch time (HO).

HO - 16.40'	Start of launch timetable with preparations for withdrawal of launch ramp
HO - 5.55'	Start of preparations for fuelling of 3rd stage
HO - 5.30'	Withdrawal of launch ramp
HO - 4.25'	End of preparations for fuelling of 3rd stage
HO - 3.35'	Fuelling of 3rd stage
HO - 1.05'	Start of operation of remote control of rocket
HO - 50'	Drive motor of "Skynet 4B" is charged
HO - 45'	Drive motor of "Astra 1A" is charged
HO - 6'	Start of synchronized launch sequence
HO - 3'30"	Green light for all control systems
HO - 60"	Switching control unit of rocket to onboard supply
HO - 5'	Opening the cryogen arms
HO -	Ignition of 1st stage and of boosters with liquid fuel
HO + 3"	Ignition of boosters with solid fuel
HO + 3.4"	Launch
HO + 12"	End of vertical climb of rocket
HO + 1'06"	Separation of solid-fuel boosters
HO + 2'29.1"	Separation of liquid-fuel boosters
HO + 3'34.4"	Separation of 1st stage
HO + 3'35.8"	Ignition of 2nd stage
HO + 4'45.6"	Opening of shroud of satellite capsule
HO + 5'44.9"	Separation of 2nd stage
HO + 5'48.5"	Ignition of 3rd stage
HO + 6'35.0"	Rocket picked up by ground station in Natal, Brazil
HO + 12'25.0"	Rocket picked up by ground station on British Island of Ascension (Atlantic)
HO + 16'55.0"	Rocket picked up by ground station in Libreville, Gabon
HO + 17'49.4"	3rd stage burnout
HO + 20'07.4"	Separation of "Skynet 4B" satellite
HO + 22'26.4"	Separation of upper part of satellite capsule
HO + 24'17.4"	Separation of "Astra 1A" satellite
HO + 30'08.4"	End of Ariane mission No 27

Once the "Astra" satellite leaves the rocket capsule, it is on an elliptical orbit around the earth. The point on the earth that is nearest to that orbit is at an altitude of 200 km and the point that is furthest removed is at an altitude of 36,000 km. On that trajectory—called transfer orbit for stationary earth satellites in technical jargon—the satellite circles the earth several times.

Just 2 days later (11 December), when "Astra" has once again reached the highest point of the transfer orbit, the engine is started and that gives the satellite the necessary power to get into a circular orbit at a distance of 35,786 km around the earth. At that altitude, the earth's force of gravity and the centrifugal force of the satellite cancel each other out, as a result of which "Astra" becomes geostationary (that is to say, it revolves synchronously with the earth so that, looking at it from here, it is not moving).

On Monday, 12 December, the satellite's solar cells are unfolded. Once "Astra" has reached its final orbital position at 19.2o East (over Zaire), a series of tests will begin on 29 December to check "Astra" as to its functional effectiveness. This work will last about a month so that "Astra" will be fully operational on 20 January 1989 and can be officially placed in service on 1 February.

The Ariane-4		Height Level
Booster Rocket		**58.40 m**
Satellite Capsule	Height: 13.50 m Diameter: 4 m.	
Control Unit		45.90m
	Height: 1 m	
3rd Stage		**44.90 m**
	Empty Weight: 1,200 kg Height: 9.90 m Diameter: 2.60 m 10.5 t of fuel (H_2O_2) at -175° C(O_2) and -250° C(H_2) Engine: HM7B Thrust: 63 kN Burn time: 725 sec Burn pressure: 35 bar Maximum speed: 9.740 km/sec	
		37.80 m
Intermediate Stage Between 2nd and 3rd Stages		**35.00 m**
Second Stage		
	Empty Weight: 3,285 kg Height: 11.40 m Diameter: 2.60 m 34 t of fuel (N_2O_4 + UH25) Engine: Viking IV Thrust: 786 kN Burn time: 124 sec Burn pressure: 58.5 bar Maximum speed: 5.379 km/sec	
		26.90 m
Intermediate Stage Between 1st and 2nd Stages		
1st Stage		23.60m
	Height: 3.60 m Diameter: 3.80 m 226 t of fuel (N_2O_4 + UH25) Engine: Viking V (4x) Thrust: 2,700 kN Burn time: 205 sec Burn pressure: 58.5 bar Maximum speed: 2.786 km/sec	
2 Boosters with Liquid Fuel		
	39 t of fuel Engine: Viking VI Thrust: 666 kN Burn time: 135 sec	
2 Boosters with Solid Fuel		
	9.5 t of fuel Thrust: 625 kN Burn time: 34 sec Total weight: 471 t	

Problems With Hermes Space Shuttle Design Described

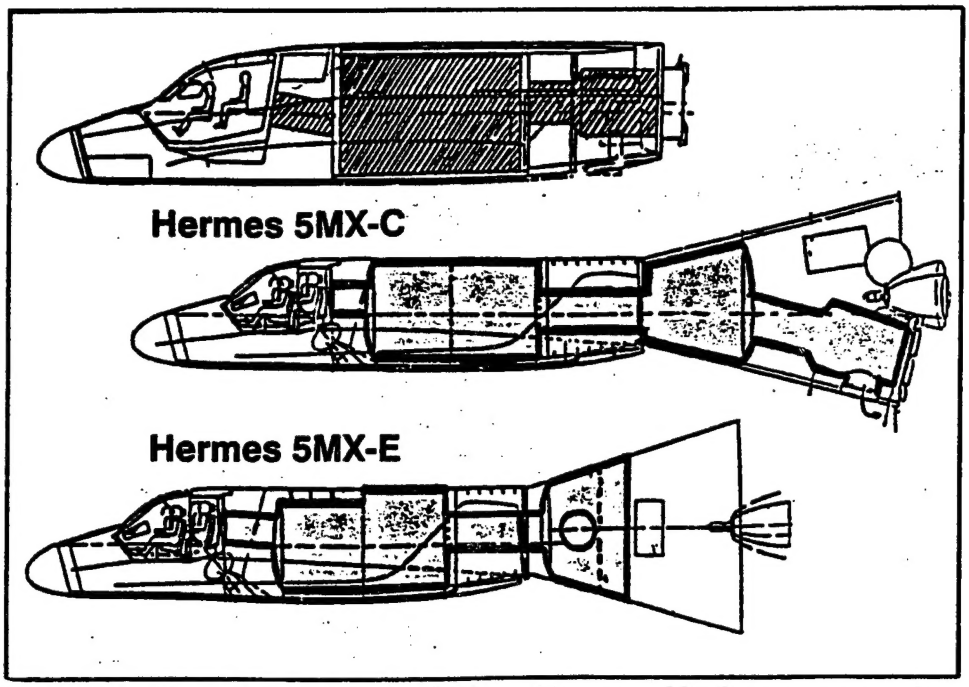
36980110a Stuttgart FLUG REVUE in German Dec 88 pp 18-19

[Article by Goetz Wange: "Another New Design for Hermes Space Shuttle: Flying Changes"; first paragraph is introduction]

[Text] Until the end of 1990, the Europeans, under the leadership of French industry, have time to present an acceptable design for the Hermes space shuttle. At present, it looks more like tinkering than a solution: Changes are continually being made.

Much is in flux, and outsiders are often hard put to keep up with things, since the Hermes space shuttle continually presents development engineers with new problems. Thus far, the attempted solutions have been so unsatisfactory that the shuttle's critics are perpetually handed new ammunition. In order to add the crew rescue system, which alone weighs three tons, mass has to be saved elsewhere. And in order to maintain the fixed three-ton payload capacity for transport into space, the engineers are having to dig deep into their bag of tricks.

The French firm Aerospatiale has submitted to ESA various alternative designs for Hermes, under the designation 5MX. The common element of all of them is that the external dimensions are considerably smaller than in the basic 5M2 model, which was based on an orbiter length of 15.5 m and a wing span of 10.5 m. As an additional element, the Hermes Resource Module (MRH) has emerged. The originally simple transitional structure to the Ariane 5 booster rocket has now become an adapter that takes on functions in order to relieve the overburdened orbiter. The drawback is that all the subsystems located in the adapter—such as the engine—must be written off, since the entire unit is separated prior to reentry into the earth's atmosphere, where it burns up.



The appropriate design for Hermes has yet to be found. The problems caused by the crew rescue system are pressing. The 5M2 design (top) from 1987 shows an orbiter measuring 15.5 m in length. Now, the 5MX-C is favored (middle); the orbiter (13.1 m) is supplemented by the Ariane adapter. Hermes 5MX-E was rejected because the docking point on the top side of the fuselage was too small. The diameter of the Hermes has been reduced.

In order to keep losses to a minimum, Aerospatiale finally presented the 5MX-E variation last summer, whereby the docking port is shifted back from the adapter to the top side of the shuttle's fuselage. This presented ESA managers with a predicament: Because of Hermes' smaller fuselage diameter, the docking mechanism was now supposed to have "condensed," European dimensions as well. However, this jeopardized the overall system philosophy, since ultimately the space shuttle was intended to supply the free-flying European lab—Man-Tended Free Flyer [MTFF]—and its docking mechanism has to fit the international space station, where it must dock for general overhauling.

Currently, the Hermes 5MX-C is the favorite, a design that was actually rejected once before. The overall system, with the MRH adapter, is 19.85 m long. This includes the actual orbiter of only 13.1 m. The individual segments of the pressure-impacted loading zone are interconnected by tunnel units—bottlenecks that demand of the astronauts gymnastic abilities during the loading and unloading of payloads. There is justification for doubting whether a fully equipped lab rack can be maneuvered through this labyrinth. Integrating this design in space would significantly increase stress on the astronauts.

Robot Arm Stays in MTFF Lab

The docking point in the Hermes 5MX-C is back in the rear of the adapter and at the end of a tunnel connection. Also integrated here is the air lock, the exit hatch for the Hermes crew if an extravehicular maneuver is required.

The change in the configuration of Hermes affects the Hermes Robot Arm (HERA). The move to the 5MX design meant removal of the two flaps on the top side of the fuselage that were supposed to hold the heat radiators. At the same time, these flaps were intended to protect the manipulator arm while the vessel travelled through the atmosphere. Now it seems more likely that HERA will be stationed on the Man-Tended Free Flyer. There are to be four fixed points there at which the astronauts can mount and adjust the manipulator arm. Corresponding cable connections then ensure that HERA can be controlled from a station in the Hermes cockpit.

The last word has yet to be spoken about what the crew rescue system in the European space shuttle will actually look like. The subsystem is in fact the responsibility of the firms joined together in the German Hermes project. However, the German engineers have not been simply turned loose on the problem; they may only develop that which the French have already thought up. And the French in turn are not at all certain whether the Crew Escape Module, whereby the entire cabin section is separated from the orbiter in an emergency and can be accelerated by a rocket attachment, is the right direction, since this rescue system, which is known internally as

"Capsule Type B-A," is very large—with all the corresponding drawbacks for Hermes' payload balance. In addition, Europeans have no experience developing, building and qualifying the capsules.

An alternative solution that is being studied is a design whereby the crew compartment is not separated, but rather the entire front section of the orbiter is explosively severed. This solution is called the "short-nose" capsule, since the shape of the Hermes nose must be short and stocky for aerodynamic reasons. An extension at the tip of the nose contains the rocket attachment, which pulls the front section of the space shuttle away from the fuselage in a rescue situation. Wind tunnel tests with this design have already been conducted.

Hope still lingers that an ejection seat system can be used. Each of the three Hermes pilots would be ejected independently, similar to with combat aircraft. This would solve part of the Hermes weight problem, since the mass is well below that of the rescue module. However, ejection seats that cover the range of performance demanded by Hermes are not available on the market and would have to be developed from existing systems. With open ejection seats, there is also the need for pressurized suits and other additional protective equipment for the Hermes crew. Also under consideration are enclosed ejection seats, in which an oversized visor encloses the pilot prior to expulsion and protects against external effects.

Further study will show which final configuration will be decided on for the rescue system and for the overall Hermes space shuttle. There is no reason to be optimistic. Entirely new thinking is needed, because the program is too expensive to serve merely as a testing system for winged reentry systems.

Italy, FRG Debate Columbus Module Ground Control

36980110b Stuttgart FLUG REVUE in German Dec 88 p 19

[Text] An elaborate support center for the Columbus docking module (APM) is being developed in Turin at Aeritalia.

With a 25 percent share, Italy is the number two country (after the FRG, with 38 percent) within ESA in terms of involvement in the Columbus space station program. Of particular interest is the Attached Pressurized Module (APM), the European component that will be permanently docked to the international space station. The lab is based on Spacelab technology, but consists of four segments and thus offers twice the room for experiments. The primary contractor for this element of the Columbus program is Aeritalia.

According to the decisions reached in The Hague, the member-states of ESA are hurrying along not only the space segments, but also the necessary infrastructure on earth. The Manned Space Laboratories Control Center is scheduled to be set up at DFVLR [German Aerospace Research and Testing Institute] in Oberpfaffenhofen, and the Columbus APM Center is developing at Aeritalia facilities in Turin. At first glance, the two centers have completely separate functions. However, the fact is that trouble is preprogrammed.

ESA Cannot Afford Duplicate Facilities

This is because the Germans do not want to wait for the Man-Tended Free Flyer to get working; they want to support the U.S. control center for the APM as well. Thus, one central element of the facilities in Oberpfaffenhofen is supposed to be an Operations Mission Sequence Simulator, an exact reproduction of the docked Columbus module in space. However, there will be a similar model at Aeritalia in Turin, called the Engineering Support Facility there. It is difficult to distinguish between the two.

In order for there to be no misunderstanding with the German partners, Professor Ernesto Vallerani, head of the Space Division at Aeritalia, says, "The FRG cannot lay claim to all the facilities. After all, Italy is making a major contribution to the Columbus program." On this point, he can rest assured of the support of his government and of the newly-established national space agency.

While the DFVLR in Cologne is stilling fooling around with studies intended to define the responsibilities of the Oberpfaffenhofen center within the Columbus program, the Italians have apparently been moving full steam ahead. ESA cannot afford duplicate facilities, because ultimately that agency will have to see to their maintenance.

The DFVLR sees no direct competition between the German and the Italian centers for Columbus: "We see ourselves during the APM mission as the coordinator of all European experiments in the APM. We receive the data from NASA, convert them and pass them along to the scientists," according to a report. The responsibility of the Turin center is seen as being engineering support for the Space Station Support Center in Houston.

Spain, France, Italy Plan Joint Military Satellites

36980114 Madrid ABC in Spanish 5 Dec 88 p 19

[Juan Pedro Quinonero dispatch: "Spain, France, and Italy Negotiate Creation of Defensive 'Military Space Europe'"]

[Text] Paris—After concluding the negotiation of industrial and strategic aspects of the "integrated military use" of the Helios observation satellite, France, Italy, and Spain have begun to design jointly a new family of space vehicles for military purposes. They are also now coordinating their initiatives in the military and industrial fields in order to lay the foundations for an ambitious project—a "military space Europe" of a "defensive" nature.

A very highly placed military source at the French Defense Ministry, very close to the department formulating French military space policy, has told ABC that "Spain, Italy, and France are at the forefront in planning and launching military space Europe. The Helios satellite is an essential first step. Paris, Madrid, and Rome

have now negotiated the integrated military use of that fundamental stage. In addition, our countries have now begun to negotiate on the new families of nonoffensive military space satellites and facilities which impart a very special dimension to Franco-Spanish-Italian military space cooperation.

The same source added that "France, Spain, and Italy agree on the foundations of what will be the embryo of military space Europe. Britain has not joined in this project for reasons connected with its own defense policy and its special relationship with the United States. The FRG has cited very diverse technical grounds, but basically nobody doubts that the Germans are stricken by a strong temptation to keep out of this field for historical reasons, because of the Greens' neutralist pressure, and for reasons to do with their own dialogue with the USSR. Hence the strategic importance of the cooperation between Paris, Madrid, and Rome. This cooperation underlies and is in the forefront of military space Europe."

The same source told ABC that "we have now begun to negotiate and to design together a new family of military radar observation satellites." Helios is an optical observation satellite. The new family will make possible the use of military radar in space: What is involved is the essential technological basis underlying the controversial U.S. space defense project, better known as the "Star Wars" defense project.

The "integrated military use" of Helios Presupposes creating a joint Franco-Italian-Spanish military observation center and creating three national observation centers.

Helios' development cost will be around Fr7.5 billion (around 175.5 billion pesetas). France will have a 79 percent share in the project, Italy 14 percent, and Spain 7 percent. The pictures received will be used and shared "proportionately" with this participation.

Following the negotiation of the "integrated military use" of Helios, France, Spain, and Italy have now held three top-secret working meetings to plan the new family of observation satellites which is to replace the Helios family toward the end of the century. This new family of military observation satellites will mark what is officially described as "an important qualitative leap forward in technology."

The military space Europe project which France, Italy, and Spain have begun to create is officially of a "defensive" nature.

France, Italy, Spain Studying Successor To Helios Satellite

MI890098 Rome AIR PRESS in Italian 30 Nov 88 p 2267

[Text] (AIR PRESS)—The Helios project partners, France, Italy, and Spain, are now studying the form their future collaboration in the military space business will take. Drawing upon previous experience, the new project will produce a type of observation satellite that will overcome the operational limitations of Helios. French Defense Minister Jacques Bousquet, vice president of GES [Space Study Group], announced this in Paris on 30 November.

Bousquet stated at a press conference that "the Helios satellite, which is scheduled to be launched in mid-1992, marks an important stage in the cooperation among southern European countries," adding: "this involves an optical satellite that will strengthen our surveillance capability, but which is subject to certain hazards such as the absence of clouds or the presence of solar light. With our Italian and Spanish partners," he emphasized, "we have studied the successor to Helios, a radar satellite which must overcome these problems. Unlike Helios, the new satellite will be developed by all three partners from the start and will reach the operational stage around 1993, with a launch expected between 2003 and 2005. As you know, the lifespan of an observation satellite is shorter than that of a telecommunications satellite and therefore the two Helios missions will be completed by the year 2000."

"Unfortunately," continued the GES official, "military Europe still finds it difficult to enter into joint projects in the aerospace sector. The FRG and the UK, each for its own reasons, cannot participate at present in a type of cooperation similar to the formula that works so well for southern Europe."

AIR PRESS recalls that the Helios project was established by France and that Italy and Spain are partners, with a 14 and 7 percent share respectively. A common mission center will be built for the project at an undetermined location in France. Each of the three countries involved already has an image reception station, in addition to three other stations for exploiting these images. Bousquet continued: "Another piece of news is the fact that each of the national stations will work in the interests of the other partners if necessary."

French Consider Costs of Space Cooperation With USSR

36980086b Paris LES ECHOS in French 28 Nov 88 p 2

[Text] A French cosmonaut every 2 years in a Soviet space flight: that is the last-minute "good surprise" announced Saturday evening by Francois Mitterrand after his quick lightning trip to the USSR. The trip ended handsomely in Baikonur with the completely successful launching of Soyuz TM7 carrying three cosmonauts, including Frenchman Jean-Loup Chretien, who is to spend almost a month in the Soviet Mir orbital station.

However, the announcement of this agreement in principle—to be confirmed 3 months hence—toward apparent strengthening of French-Soviet space cooperation, and obtained obviously in return for France's loan of some 10 billion francs to the USSR, raises many questions.

The surprise could prove to be unpleasant, particularly if it is confirmed that the Soviet Union intends to have France pay the cost of the future trips. That is already what is happening with Austria, and could be the case with the FRG. For its part, France hopes to reach a compromise solution with the USSR by proposing scientific exchanges and increased technical cooperation.

There is also a question of the future space plane Hermes and the future Soviet orbital stations being provided with a system to permit linkingup. However, the amount for such compensations promises to be huge, since the cost for one flight such as the Soyuz TM7 is estimated—by officials of Glavkosmos, the Soviet flight agency—at between $10 and $20 million!

Perestroika compelling, in future the Soviet space agency has to figure its costs. Moreover, people are well aware in Moscow that the demand is much greater than the supply in the world market for launchers. The purpose of the media promotion of Soviet flights is not only to affirm the technological quality of that country but also to establish it as a competitor on the world market.

France, which seems determined to maintain its progress in manned flights—Jean-Loup Chretien is making his second flight with the Soviets, and Patrick Baudry had participated in a mission on the American shuttle—as well as its leadership in European space programs, will perhaps have to agree to some sacrifices.

EUTELSAT Decides on 6-Satellite Network

AN890074 Chichester EURO-TELECOM in English 13 Jan 89 p 4

[Unattributed article: "EUTELSAT To Provide Six-Satellite Operation"]

[Text] At a meeting of the Board of Signatories of the European Telecommunications Satellite Organisation (EUTELSAT) it has been decided that the Organisation will provide a network based on at least six operational satellites in order to satisfy existing and anticipated demands for protected satellite capacity in Europe.

The first four EUTELSAT II second-generation medium-power satellites will take over and extend the operation of the four EUTELSAT I satellites currently in orbit. By the time they are in orbit, two EUTELSAT I satellites (F1 and F2) will have reached the end of their lives. The remaining two operational EUTELSAT I satellites (F4 and F5) will continue to be used during a transitional period.

To ensure as rapid an availability as possible of four operational EUTELSAT II satellites, Aerospatiale, prime contractor for the programme, has agreed to accelerate the delivery of EUTELSAT II-F3 and subsequent flight units. As a result, a network of four EUTELSAT II satellites will be commercially operational by the end of 1991. The first is scheduled for launch in spring 1990 and the following satellites will be launched at six month intervals.

In addition, EUTELSAT has authorised Aerospatiale to build the hardware necessary to provide a specially tailored Superbeam coverage of Turkey on a further EUTELSAT II satellite. The Turkish authorities have confirmed reservation for five transponders with this Superbeam coverage, plus a sixth transponder with Superbeam coverage over Central Europe. This network is expected to start operating in early 1992.

A decision to procure EUTELSAT II-F5 is expected to be taken by the EUTELSAT Board of Signatories in the forthcoming weeks, and no later than the end of February 1989. It is expected to be followed by an order for F6 towards the end of 1989.

COMPUTERS

European Researchers Study Possible Joint Computer Projects

36980111b Stuttgart VDI NACHRICHTEN in German 9 Dec 89 p 29

[Text] Bonn, 9 Dec 88—Many scientists believe that the European internal market will also offer opportunities for research. Recently, German, French and Dutch computer specialists from various research institutes met for an exchange of ideas.

Europe is expected to not only grow into one economic unit, but also develop into a common research market. This is important for computer technology in particular, since international research and development could provide a counterbalance to the dominant forces on the market, the United States and Japan.

For this reason, the respective national research institutes of France, the Netherlands and the FRG met in Amsterdam at the end of November for a working meeting. Present were the National Institute for Research on Data Processing and Automation (INRIA) in Rocquencourt, near Paris, the Center for Mathematics and Data Processing (CWI) in Amsterdam and the Association for Mathematics and Data Processing (GMD) in Sankt Augustin, near Bonn.

The three institutes want to draw up a declaration by January 1989 describing joint research projects. Preparations are being made for a journal to publish the respective projects and results. Also being contemplated is a scholarship program for college graduates, doctoral candidates and post-doctoral candidates, to be supported financially by the EC Commission. The scholarship recipients are to work at two of the three institutes within a period of 18 months.

According to GMD executive board chairman Prof Gerhard Seegmueller, Europe-wide cooperation in computer science and technology makes sense, because each of the three institutes has strengths upon which the others can build. Thus, the French are ahead in robotics, the Dutch in theoretical mathematics and the Germans in office communications. However, in order to achieve these goals, bureaucratic barriers must be dismantled, and the institutes must be geared towards a European perspective. The GMD should thus gain a freer hand in the allocation of budgetary resources. The everyday problems being experienced begin with a shortage of funds for travelling. Still, the information sciences trio will not escape entirely without internal problems. The points of contention that will regularly arise center on patent and licensing issues. Nevertheless, Seegmueller sees the three institutes as the "computer science conscience of Europe." And due to their specialized know-how, the three of them are expected to leave a mark on national and EC-wide research programs.

There are currently national research institutes for computer technology in only 3 of the 12 EC member-states. In Great Britain, such institutions are private and are more closely involved in working with industry. In the United States and Japan as well, there is nothing that is directly comparable to the GMD. However, the American market includes between 5,000 and 8,000 scientists working at private institutes. In contrast, the GMD employs 1,350 people, of which approximately 900 are scientists. The INRIA has 900 employees, and the CWI 150.

EUREKA Software Development Consortium Formed

36980088b Duesseldorf HANDELSBLATT in German 24 Nov 88 p 14

[Article: "First Software Factory To Be Tested in 1992"; first paragraph is HANDELSBLATT introduction]

[Text] Europe-wide research project headquartered in Berlin will run 10 years. Because, according to experts, in the next few years demand for software will far exceed currently identifiable development capacity, great importance is attached to tools to increase the productivity of software developers. Therefore, in the framework of the ESF EUREKA Software Factory Project, engineer-level production is to be accelerated and worldwide standards established.

To that end, 13 research and industry partners from five European countries (the Federal Republic of Germany, France, the United Kingdom, Sweden, and Norway) have decided to form a consortium. The headquarters established in Berlin for the project, which has just been announced, will coordinate and direct the activities. DM750 million are available to the 10-year project, which will be distributed over 24 company locations in Europe and will employ an average of 240 specialists. The initiative's primary goal is reportedly to enhance the competitiveness of the European software industry.

The software industry according to data from AEG board member Dr Peter Stehle, in 1987 alone increased its sales in the FRG by 18 percent to DM18.6 billion. Thus now it is not only one of the strongest economic growth sectors but is also increasingly assuming a role as a driving force for other branches, such as plant construction, power and fuel supply, and the automotive industry. In 1988 the volume of the German data processing market is expected to reach approximately DM40 billion, almost half of it in the software and service area. Beginning in 1990 software's share will exceed that of hardware, and as early as 1992 will constitute more than 60 percent of the total volume.

However—lest software become a bottleneck to growth—the productivity of software developers must be increased significantly. In the words of Stehle, this can only be accomplished with new technologies; therefore, the "leap from software handicraft to the software factory is long overdue."

By this he means computer-aided industrial software development, i.e., special programs—software tools, in other words—which support the division of labor in software development. Similar to the situation in other fields of engineering, where, for example, nuts and engines are reusable components for several applications, ESF is to create both components and standards for the software market. In this, ESF intends to keep in mind all software applications—commercial and industrial systems as well as software for telecommunications and the science sector. According to the ESF timetable, the first software factory will already be "in the test phase as a product with user applications" by April 1992.

In addition to the financial commitment of the individual consortium members—the four German partners are AEG's GEI systems and software company, Nixdorf, and Softlab, as well as the University of Dortmund—the ESF project will be funded by all five participating countries. Among the 214 current EUREKA projects, ESF ranks fourth in terms of volume.

FRG: New Max Planck Institute of Computer Science Established

MI890115 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German21 Dec 88 pp 12-13

[Text] The board of directors of the Max Planck Society (MPG) decided at a meeting held in Munich on 10 November to establish a Max Planck Institute of Computer Science in Saarbrücken. The new institute will focus on basic research in the field of computer science, under the broad topic of "massively parallel computer

systems." In parallel data processing, individual computing operations that were previously performed consecutively by a central computer, are carried out simultaneously by several computing units arranged in parallel. This concept, based on the way information is processed in the human brain, is considered particularly promising although it requires new developments in computer hardware and, in particular, software.

The activity of the new Max Planck Institute of Computer Science will focus on the following fields:

—Parallel algorithms,
—Programming languages for parallel computing systems,
—System models and tools for system programming, and
—Hardware architecture for massively parallel systems.
—Application orientation—e.g. numerical simulation—where the level of construction problems related to parallel computer systems will be analyzed through cooperation with industry and the relevant research institutes, will also be covered by the institute.

These five topics are reflected in the institute's division into five departments, three of which will be established from the outset.

The Max Planck Society's board also decided to appoint 56-year-old computer scientist Prof A. Nico Habermann as the director of the institute. Born in the Netherlands, Habermann studied mathematics in Amsterdam and Eindhoven and left for the United States after obtaining his doctorate. Since 1980 he has been director of the renowned computer science department at Pittsburgh's Carnegie Mellon University. By appointing Professor Habermann, who is considered one of the most oustanding exponents of applied computer science, the institute is expected to attract younger scientists both in the FRG and abroad.

Chief of FRG's Nixdord Discusses Budget, Marketing Problems

36980095 Duesseldorf HANDELSBLATT in German 28 Nov 88 p 15

[Unattributed article: "Nixdorf Computer AG Chief Executive Officer Luft Mentions Two Transitional Years - Ambitious Sales Goals Out of Reach"]

[Text] vst. Paderborn. As chief executive officer Klaus Luft explained in a conversation, Nixdorf Computer AG, Paderborn, which had predicted as late as spring 1987 that sales would double to DM 9 billion by approx. 1991 has lowered this goal. In his words, an increase in sales of only 5 to 10 percent each is expected for the "transitional years" 1988 and 1989.

Recently, the company stated that the 11 percent increase in sales for the first six months of 1988 could not be maintained for the whole year. In 1987, Nixdorf increased sales by 12.6 percent to DM 5.07 billion.

"We expected more orders," Luft said. In addition, the profit margins "fell apart". The financial institutions as their major group of customers are stretching out their investments. The market which is experiencing overcapacity is no longer growing as rapidly as it used to. In addition, price pressure is stronger than ever. The price for a system could drop by 35 percent within ten months.

Luft said that the number of suppliers in the computer industry increased compared to other industries. Since on the other hand, standards are becoming increasingly accepted, large customers are now working together with ten or more suppliers of technology.

Luft characterized the future role of Nixdorf AG as that of a "system integrator" with emphasis on providing application solutions. Nixdorf is the largest supplier of this kind worldwide. The company which counts itself among the largest software houses in Europe, wants to strengthen cooperation with other software houses and use increasingly its own software and that of others. As Luft pointed out, in the future the hardware will be increasingly supplied by low-cost foreign countries.

In the present transitional phase, development of existing products has to continue while offering an "extremely broad product line". In addition, in view of the increased acceptance of standards the company wants to concentrate on the core markets such as banks and insurance companies, retail stores, small and medium-sized firms, large customers and communications technology.

The work force which in 1987 increased by 3900 to 29440 people worldwide, is expected to increase by another 1600 in 1988, and to decrease after that, however, with a simultaneous increase in productivity. The percentage of those employed in manufacturing—currently 20

of all employees; almost two thirds work in areas with close customer contact—is expected to drop slightly in the future. Mutual deliveries and the exchange of licenses is to be encouraged.

R&D expenditures which were DM 477 million in 1987 are expected to remain at that level for the next few years. Since going public in 1984, the company has invested more than DM 2 billion in assets, and the plants have been expanded over the past three years, so that no increases are required in this area.

Luft declined to give detailed information on the profit situation. Recently, it was announced that based on current figures last year's dividend of DM 10 per DM 50 share could not be guaranteed. Still, according to Luft

the company expects to make a profit. The company does not expect an annual net profit of DM 260 million after taxes which corresponds to the 1987 level until the early nineties.

Nixdorf will try to maintain the high equity to balance sheet total ratio of 62 percent. This figure puts the company in third place in the industry worldwide and in the top slot in the Federal Republic among the industrial companies listed on the stock exchange. The company might sell some real estate.

According to Luft, the company may issue convertible bonds with an eight-digit value which are intended for employees.

FRG Research Groups Discuss Achievements in Neural Computing

3698M070 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 25 Oct 88 p 8

[Text] A meeting of German neural computing scientists in Mainz marked the beginning of coordinated research activities in this up-and-coming research field. Based on an initiative of the Ministry for Research and Technology (BMFT), 9 research groups from various universities, the Max Planck Society, and one industrial firm met to discuss new ways of using the results of brain research to develop computers with as yet unheard-of properties. The BMFT will provide this long-term project with approximately DM15 million in subsidies for an initial 3-year period.

The scientists' objective is to convert models and new discoveries in neurobiology theory relating to the brain's principal modes of operation into information processing methods. Research will focus on the following three fields:

- Properties of parallel network architectures;
- Principles of self-organization;
- Organization of knowledge.

These themes link the joint project very closely to the related fields of brain research and theoretical computer science/artificial intelligence, so that intensive interdisciplinary dialogues can be planned. For maximum efficiency, the participating researchers coordinated their work in a preparatory phase that lasted almost a year. Their tasks were arranged in such a way that partial solutions could be used several times. Furthermore, identical computing systems and programming environments will be used within the joint project to facilitate the rapid transfer of software and information. Research topics have initially emerged in the following areas:

- Processing of image sequences from the natural environment;
- Movement control of autonomous robots.

Tasks were formulated that can be performed in the brain of a human being without apparent effort, though they can only be imperfectly performed by present generation computers. Among other reasons, neural systems stand out because they do not need precise advance instructions on how to solve certain problems and because they can adapt flexibly to changing conditions.

During the first years scientists will investigate the possibilities of using neural principles with simple functional models. The development of a universal neural computer only seems feasible as a long-term goal.

The research project is of interest not only for computer science. It offers brain research the opportunity to put suspected functional correlations to the test by synthesis. Those working on the project will have a first critical exchange of views with a related scientific discipline on 14 and 15 November 1988, when a meeting with representatives of theoretical computing will take place in Mainz. At this meeting, the main preliminary results achieved in the two specialties will be discussed.

Further information may be obtained from Prof W. von Seelen at the University of Mainz, Institute of Biophysics, Saarstrasse 21, 6500 Mainz, tel.: 06131-392471.

Siemens To Join Neural Network Project

3698A058 Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 23 Dec 88 p 16

[Unattributed article: "Siemens Joins Project ANNIE"]

[Text] Siemens recently announced its intention to join an EC project called ANNIE—Application of Neural Networks for Industry in Europe—which recently held its inaugural meeting at the Siemens research campus in Munich.

ANNIE is a new project within part II of the European Strategic Programme for Research and Development in Information Technology (ESPRIT) and is being researched by a consortium lead by Harwell Laboratories and co-ordinated by KPMG. Other participants include British Aerospace, CETIM, IBP-Pietsch and Artificial Intelligence.

The aim of the project is to pursue research into industrial applications of neural networks which process data in a computer in parallel rather than serially. Siemens indicated that its involvement would be from the user's point of view by defining objectives which can be handled more easily by neural networks than by conventional processing.

ANNIE will cost ECU 5 million ($5.92 million). Siemens will provide DM1.8 million ($1.03 million) over a three-year period, half of which will come from its own resources and half from EC investment aid.

Italian Scientific Data Processing Network Reviewed

MI890103 Turin RICERCA E INNOVAZIONE in Italian Sep-Oct 88 pp 19-21

[Article by Riccardo Oldani: "CNUCE, The Information Center of the CNR"]

[Excerpt] **CNUCE and its Structure**

Without doubt, the CNUCE [National University Center for Electronic Computation] occupies one of the most important places among all the research centers that make Pisa at the forefront of computer study.

In fact, it constitutes the point of reference in the CNR's [National Research Center] strategy in the sector of network connections and the distribution of advanced computer services for the scientific community.

To carry out this task, the center is structurally divided into technological services and research departments; more than 120 personnel units work here. The CNUCE is one of the ten largest bodies of the CNR, based on its number of employees and its level of funding.

At the center's core is the Computer Service which began operations in 1965 with an IBM 7090 system. Its power has been increasing continuously, with beneficial effects on the economy of the entire area. The university was thus able to absorb greater resources for research and teaching while the increase in users created direct advantages and led to combined initiatives.

The relationship with the users is in turn an element of stimulation and growth for the service itself. It provides the opportunity for constructive comparison, often useful for revising and improving the resources offered.

The CNUCE also directs the General Commission for Computer Science, a consulting body under the president of the CNR which is responsible for rationalizing the institution's interventions in computer resources. The center therefore plays a delicate role of fundamental importance for the choices made by the CNR and its relationship with the scientific users.

External Services

The CNUCE has assumed numerous tasks.

Apart from supplying a general service in Tuscany, it intends to maintain and develop the infrastructure of the CNR's computer network. Designing projects and implementing PRCNET and Osiride networks are very important in this context.

The PRCNET network, which became operational as an experimental service in 1979, connects all the IBM compatible centers of the CNR network and permits a managerial type of coordination and decentralization of general purpose, interactive computing.

The Osiride network conforms to international standards and allows incompatible systems to be connected. This ensures connections with the main computer centers of the university and CNR networks.

Links with international networks such as EARN [European Academic Research Network], ARPA [Advanced Research Projects Agency], COSINE-EUREKA [Committee on Computer Sciences in Electrical Engineering Education-European Research Coordinating Agency], and DIANE [Direct Information Access Network for Europe] EURONET, and the connection of local networks in the metropolitan environment are additional features of CNUCE's activity in the field of computer networks.

However the CNUCE also intends to develop specialized services for sectors that have research divisions. This means that special software must be created and made available externally. This is an activity that has assumed fundamental importance in Pisa's economic development; the CNUCE believed in this before others did. The center's director, Professor Stefano Trumpy, explains the importance of being there first: "Additional business can be brought to Pisa only if the other public research institutes follow our example and unite to qualitatively improve the supply of know-how and specialized services in the national and international interest. In this way," Trumpy concludes, "various sources of funding can be brought to the Pisa area, funding that public research in computer systems can resonably draw from."

Research Activity

This involves the services CNUCE offers externally. On the other hand, the institute's pure research activities typically focus on computer-oriented fields and a few application sectors.

In computer-oriented areas of activity, great attention is paid to the creation of hardware and software architecture, distributional and graphic systems, instruments for VLSI design, and the integration of logical and functional languages. The researchers' studies are further directed at the creation of information systems for the office and data bases—the linking of data banks resident on heterogeneous processors, and the logical design of data banks.

Groups working in the applied sectors pay special attention to computer approaches to problems; this specialization makes them unique in Italy. These groups work with control systems for satellite flights, structural engineering, elaboration of images, and musical computers.

The CNUCE has played a leading role in finalized projects on computer systems and telecommunications; it has initiated cooperation with universities and industry. Several companies have concluded agreements with the center, including IBM, Olivetti, Tecsiel, and Telespazio.

Wide-ranging participation in important international projects in the space sector, such as the one for the European space station Columbus, completes the picture of the institute's activities.

Specialized expertise with broad applications in teaching and training has been developed in all the CNUCE's divisions.

The use of human resources, their enrichment and cultural and professional development are vitally important issues for an institute such as CNUCE which must necessarily consider the opportunities and requests coming from the external environment with which it has an ongoing relationship.

Box insert

CNUCE: Some of the Connected Networks [1]

EARN

EARN [European Academic Research Network] is a large, hetereogeneous network which today links more than 600 universities and research centers in Europe. Together with the BITNET, NET-NORTH, and ASIANET networks, it constitutes a single international network, allowing a useful exchange of ideas and experiences among the world scientific community.

The junctions, mainly DEC VAX/VMS or IBM VM/CMS, are connected through dedicated transmission lines. A central system maintains international connections in every country that is connected and offers services of common interest. The connections and computer services are managed and maintained by the CNUCE in Italy.

The services offered include electronic mail, file transfer, and remote job entry.

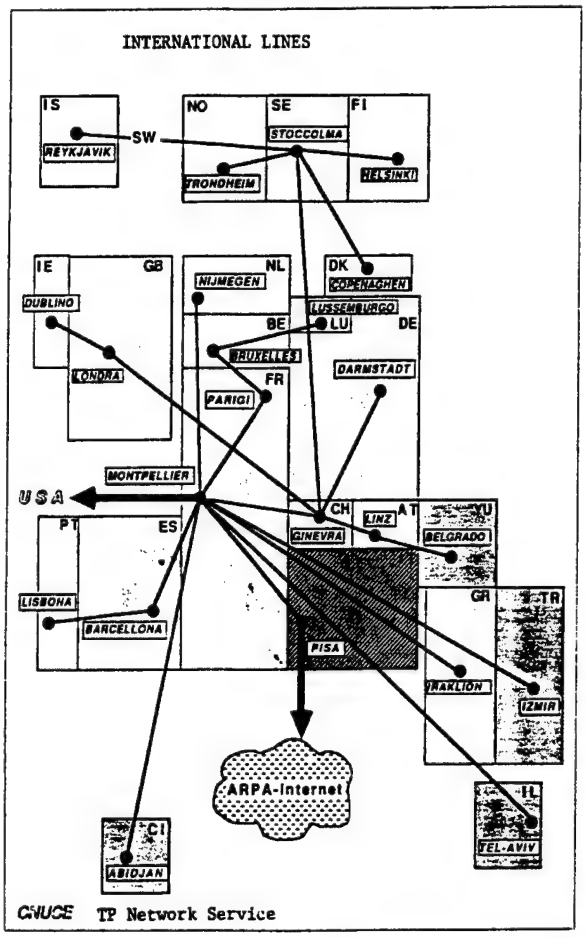
Using electronic mail, applications have been developed to furnish additional services such as electronic mailing lists, file servers, data base access, and electronic mail via gateways.

In particular, the CNUCE uses the gateway service that integrates the electronic mail services of the ARPA-Internet and EARN networks.

ARPA-Internet

The CNUCE's computer system is connected to the U.S. network ARPA-Internet [Advanced Research Projects Agency NETwork-Internet]. Sponsored by the U.S. Department of Defense, this network connects several

The countries linked to EARN, with their respective central nodes.



thousand computers that may differ in size or manufacture, and is currently operating at the most prestigious research centers, universities, and military institutions—primarily in the United States.

The General Commission for Data Processing (CGI) wanted ARPA-Internet to carry out the institute's policy of scientific computing; ARPA-Internet allows the Italian scientific user connected to the CNUCE (whether locally or through remote terminal access) to have access to the services available on the other network computers and vice versa.

These services include TELNET (remote terminal access), FTP (File Transfer), and SMTP (electronic mail).

Information on the network hosts is available from the Network Information Center (SRI-NIC). The service is supplied by the CNUCE virtual machine which is known as ICNUCEVM.CNUCE.CNR.IT within ARPA-Internet.

Osiride

In 1981, the General Commission for Data Processing assigned the CNUCE a project to link the computers of different manufacturers, taking into account the infrastructure of ITAPAC [Italian Public Network for Packet Switching). They wanted it to be created by the computer manufacturers themselves and/or by a software manufacturer, without incurring developments costs for the CNR.

The CNUCE called the project Osiride, and divided it into the following phases: definition of the specific functions (completed); development of products meeting levels 4 and 5 of the OSI-RM architecture standard, to be done by the suppliers (completed); interoperational testing of the products developed by the suppliers of levels 4 and 5 of OSI-RM architecture (completed); development by the suppliers of applied products meeting the standards (completed in spring, 1988); testing of the interoperation of applied products developed by the suppliers (currently underway); and purchase of OSI products and applying them to the CNR network (after positive results from the preceding phase).

The following firms are participating in the Osiride project: Osiride (Interoperational testing), Olivetti, IBM, Hewlett-Packard, Honeywell, Digital, Tecsiel, and Unisys.

Footnotes

1. From: "Situation in the CNR—September 1988," edited by L. Abba, D. Canino, F. Gennaio, V. Miori, and M. Sommani of the TP Service - CNUCE Networks.

DEFENSE INDUSTRIES

Problems of Sweden's JAS Gripen Project Discussed

Aerospace Industry Threatened

36980092a Stockholm DAGENS NYHETER in Swedish 10 Dec 88 p 6

[Article by Peter Bratt: "Future of Aerospace Industry Depends on JAS Project"]

[Text] The JAS [fighter, bomber, reconnaissance] project must succeed in order for the Swedish aerospace industry to survive. Now that the first experimental aircraft has gotten air under its wings for the first time, it takes place during a critical situation for the industry. Negotiations are under way for subseries two, which involves the 110 aircraft that are to follow the 30 already bought by the state.

The JAS industrial group (Saab-Scania, Volvo Aircraft Engine, Ericsson Radio and FFV Aerotech) wants to raise the price for series two in order to be compensated for the fact that the first aircraft became more expensive for the industry than anticipated. Subseries two is now offered at a price several billion higher than when the big framework contract was signed in 1982. Defense Minister Roine Carlsson immediately pulled out the heavy artillery and threatened to scrap the whole project if the price is not lowered. The managing director of Saab-Scania has replied by threatening in that case to scrap the whole aerospace industry.

No one really takes these threats seriously. The consequences of cancelling the entire project are too great. What it shows is that the armed forces are struggling with great expenditure problems in many areas. But to the rest of the world the strength of the air defense is decisive for the evaluation of the credibility of the Swedish policy of neutrality.

It is the J in the JAS which is the most important, the fighter function. Few seriously believe that the Soviet Union would try to march by land through a mobilized Sweden in order to reach the Norwegian coast, which is of major strategic importance to the Soviet Union. It would require a deployment of about 20 Soviet divisions in order to safeguard such a venture, which must take place rapidly in order not to allow NATO to bring too many large armed forces into Norway. The Soviets have about 70 divisions available, and it is not realistic to believe that the Soviets would set aside that much for such a difficult task. Northern Norrland is easily defended and a mobilized Sweden has considerable forces at its disposal.

In the Pentagon it is not believed that the Soviet Union has troops trained for such a mission. There, one is of the opinion that the Soviet Union would try a naval maneuver in combination with attempts at aerial landing. NATO anticipates that a Swedish fighter force would have sufficient strength to resist attempts to overfly; to NATO that is the most important element in evaluating the credibility of the policy of neutrality.

An invasion attempt against Sweden across the Baltic Sea is also not very credible, and even less so since Sweden is able to launch a large number of torpedoes from submerged submarines against the ships of the invasion fleet. The Soviet Union further lacks tonnage for both an invasion of Sweden and an occupation of the Belts, which are much more important strategically to the Soviet Union.

In sum, this means that both the Navy and Army in principle can lose strength without truly serious foreign policy consequences, but the fighter aircraft force cannot. A so-called Swedish profile is of great significance in this respect. The JAS is built to be able to land on short sections of road, wartime bases. It is to be adaptable for fighting (IR and radar-guided missiles), bombing (loaded with bombs or naval missiles) or reconnaissance, according to need. The alternative to the JAS is the U. S. F 16 or F 18. They cannot be adapted to a Swedish profile. Since Roine Carlsson has now charged the Supreme

Commander with studying the possibility of buying a foreign plane, as well as the consequences of cancelling the JAS, it is felt by both industry and the Defense Staff that this is an empty threat.

What is important at this time is that the aircraft is capable of living up to the performance data required of it in order effectively to defend the country against foreign air attacks. The JAS must be able to oppose Soviet fighters, and, at least in theory, NATO fighters.

The most important demands involve engine thrust per kilo of aircraft, instantaneous turning performance as well as stationary turning performance. The JAS has 30 percent more thrust per kilo than Viggen and about the same as the F 16 and F 18, NATO's best fighters.

The turning performance is decisive in aerial battles. Instantaneous turning is the capability of immediate maximum turning, in order to avoid or come from behind a closing opponent.

Stationary turning is the classic "dogfight," how far an aircraft can turn in a fast circular orbit without losing speed. The F 16 and F 18 can manage 20 degrees per second, a Mig 23/27 17 degrees and the JAS 20 degrees. Viggen, with a turned-on afterburner, can only turn 14 degrees. This optimum turning capability applies to a specific speed which varies between the aircraft but lies in the range of 550-700 km/hour. This means that a JAS can turn six degrees more per second than a Viggen. That means that the JAS turns 180 degrees more than Viggen in 30 seconds. If they are circling in order to manuever into firing position for a heat-seeking missile, it means that after half a minute the JAS has gained half a revolution. From lying right in front of each other, the JAS will be right behind the Viggen in 30 seconds. The JAS gains three degrees per second on a Mig 23/27. That means a minute to gain half a revolution. But the Mig 29, which is now on its way out to the Soviet units, has performance data just as good as the F 16 and F 18.

1992 Still Production Goal

36980092a Stockholm NY TEKNIK in Swedish 1 Dec 88 p 4

[Article by Mikael Holmstrom and Tom von Sivers: "Time Schedule on Track, JAS Leadership Promises"]

[Text] "We will manage the delivery of JAS Gripen by 1992," just as in the contract."

"But if the state wants to study a foreign aircraft alternative, that's quite OK."

Those are the words of Harald Schroder, managing director of the JAS industrial group, with reference to the recent discussions about cancelling the program.

At Saab in Linkoping work continues on the JAS as usual, despite the recent talk about cancelling the program.

Before the first test aircraft takes to the air, a number of taxi tests must be undertaken. These require permission from the Defense Materiel Agency (FMV).

"This request is quite imminent," says Milton Mobarg, responsible for JAS flight testing.

Taxi tests as a rule take a few weeks. If the tests turn out well, the JAS could take off at the end of December, at the earliest.

You have promised flight testing before. What says that you will manage it this time?

"Nothing says that. But the closer we come, the more certain we are that we will manage it," says Harald Schroder, managing director of the JAS industry group (IG JAS).

But he agrees that it is not good for credibility that the test flight date has continuously been postponed.

Error in Judgement

According to the contract, the first test aircraft should have taken off before January 1987—almost 2 years ago. The foremost reason for the delay is, according to Harald Schroder, an error in judgement of the amount of labor needed for development of the electronic navigation system.

It is also a public secret that JAS has had major difficulties with one of its subcontractors, U. S. Lear Siegler, which has developed the software for the navigation system.

"We do not think they have done a good job," Harald Schroder says.

Now, Saab reports that all software tests needed for the first flight are completed.

But the Air Force has expressed concern about not having the first JAS aircraft in 1992 as promised.

Harald Schroder finds it difficult to understand that concern.

"We will manage 1992. The plane will be sufficiently ready for the Air Force to be able to train its people and begin tactical training."

But will the plane be as ready then as was intended from the beginning?

"Perhaps not in all details, but there will not be any changes," Harald Schroder says.

The recent discussion about cancellations began when JAS submitted its bid for subseries 2. Those are the 110 aircraft which are to be delivered from 1995 to 2000.

The contract between the FMV and IG JAS includes an upper limit for the cost of subseries 2.

The FMV now considers IG JAS to have exceeded this ceiling by several billion kronor.

But Harald Schroder has a different view.

Not Exceeded

"I wouldn't say that we exceeded the limit. But I gather that is how the FMV has perceived our most recent bid. Beyond that, I do not want to discuss ongoing negotiations."

But Harald Schroder is calm with respect to foreign competitors:

"The only thing I know is that foreign alternatives such as (French) Rafale and (joint European) EFA are considerably more expensive."

We have encountered irritation in Stockholm over the way the leadership of IG JAS has handled the project. This irritation has been fueled anew with your bid.

"Yes, there is irritation. But it concerns primarily the formulation of the contract," Harald Schroder says.

He denies all statements that IG AS tried to cover losses in subseries 1 by asking a higher price for subseries 2.

"There is no possibility of recouping losses in that manner. The state has protected itself in the contract, and has such good control that this is not possible."

JAS Crisis Threatens Antiradar Missile Budget

36980092b Stockholm NY TEKNIK in Swedish 8 Dec 88 p 5

[Article by Mikael Holmstrom and Tom von Sivers: "JAS Crisis Threatens Swedish Missile Effort"]

[Text] The financial crisis of the JAS project is now threatening the Swedish missile effort. In order to save the JAS project, the industry wants to use some of the money set aside for Swedish radar-guided missiles.

In that case, a new parliamentary decision is required.

The negotiations between the industry group, IG, JAS and the Defense Materiel Agency, FMV, have bogged down.

One of the industry's negotiating cards is the threat to shut down unless additional money is added.

But neither the state nor the industry wants to force a shutdown.

At the same time it is unlikely that new money could be added from the political side.

According to information available to NY TEKNIK, IG JAS is therefore expected to propose that some funds be transferred from the Swedish radar-guided missile program to the JAS aircraft.

But this requires a new parliamentary decision. It was in 1987 that Parliament allocated funds for a Swedish radar-guided missile program.

The idea was first to develop a modern all-weather missile, Robot 71 A, for both Viggen and JAS, and then to go on and build a more advanced missile, which would be entirely Swedish, Robot 73.

At today's monetary value, the two missile programs cost at least 12-14 billion. It is part of that money over which the industry wants to negotiate.

Doubtful

"That is an alternative," says Undersecretary Jan Nygren of the Defense Department.

But at the same time he is very doubtful regarding this solution:

"It must be weighed against what it means to have a weapon with a Swedish profile on the aircraft," Jan Nygren says.

To the Social Democrats, above all, it has been important to have the safeguard which a Swedish missile program would imply. There are three reasons for this:

- In order to get a missile which can be bought earlier than the U. S. AMRAAM.
- In order to keep and develop a Swedish missile capability.
- In order to escape the dependence on the United States. When the heat-seeking Sidewinder missile was to be delivered to Sweden, it was delayed at least 6 years because of political problems between Stockholm and Washington.

If the politicians would now be prepared to take money from the missile program, it would be because the situation has changed:

- The bids submitted by Saab Missiles in earlier years show that the missiles would become at least 2 billion kronor more expensive than anticipated. But the last word has not yet been said. The FMV is awaiting a new, lower bid from Saab Missiles for Robot 71 A.
- The share of Swedish industry in the projects has shrunk drastically. Today, most indications are that foreign industry will do most of the work.

- Today, the politicians hope that the U. S. AMRAAM missile will get competition, from France, for example, which is working on the Mica missile. This would result in an alternative and the need to develop Robot 73 would decrease.

The movement of funds from missiles to aircraft is also included in the directives for the Supreme Commander's quick study on JAS.

Another directive is to keep both the missile program and the JAS aircraft and postpone Robot 73, at the same time as the planned number of JAS aircraft in subseries 2 is trimmed.

TRT of France Supplies Thermal Camera for Laser Weapon

3698A039 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English 10 Nov 88 p 2

[Unattributed article: "TRT: Thermal Camera"]

[Text] Under the cooperation agreement between Thomson-CSF and TRT [Radioelectric and Telephone Communications] for integration of thermal cameras within Thomson pods, TRT has supplied its camera for the convertible laser designation pod made by Thomson-CSF. The two firings recently made from the Landes test center of an Aerospatiale AS 30 laser missile fired at night from one of the flight test center's Jaguars owed much of their success to this camera. In this configuration the TRT thermal camera takes the place of the daytime multi-spectrum TV camera, thus optimizing performance of the laser weapon system around the clock.

FACTORY AUTOMATION, ROBOTICS

Results of Joint FRG Robotics Project Reported

36980108a Stuttgart VDI NACHRICHTEN in German 9 Dec 88 p 21

[Text] Berlin—The results of the cooperative project "Components for Advanced Robot and Material Handling Systems" were presented in November at the Berlin Production-Engineering Center (PTZ). The upshot in relation to the Manufacturing Engineering Program of the Federal Ministry of Research and Technology (BMFT): The stand-alone robot is out of the question.

Characteristic of a large proportion of industrial applications such as assembly lines and cells, body-painting lines, welding lines, and flexible manufacturing systems is the fact that the industrial robot is functionally meshed into its manufacturing environment. The existing manufacturing tasks require a number of mostly different robots to work together in a coordinated fashion with one another and with machine tools as well as storage and transport equipment, but the controlling and programming of such systems is difficult.

Therefore, with the goal of further developing robot-system components 16 firms and institutes have been conducting joint research and development work on five main subject areas, which are concerned with the control system, the drive systems, new types of kinematics, and with special measuring methods for industrial robots. The total sum of government assistance for the last 3 years: DM 18 million.

Graduate Engineer H. Wolter of the Manufacturing Engineering project support group at the Karlsruhe Nuclear Research Center—the group in charge of the cooperative projects—says in this regard: "In order to guarantee the cooperative character of the project on the one hand and on the other hand to utilize in the best possible way the specific interests and capabilities of the industrial partners, the project approach is oriented strongly toward problems facing the industrial partners that are specific to certain product areas." As the project execution and the results achieved have shown, he says, this way of proceeding has made it possible to achieve an intensive, firm-overarching, and cooperative collaboration on the part of the project partners.

In subproject 1, methods and functions that could be transferred to various applications were developed and tested by means of models, such methods and functions being those that achieve a reduction in the development cost, a simplified initial startup, a reduced malfunction susceptibility, an improved superintendence and maintenance capability, and greater flexibility for shared kinematic systems and their control units.

In subproject 2, by way of a robot-based designing of the drives used and through new energizing and regulating systems it proved possible, among other things, to considerably improve the power/weight ratio while increasing reliability and reducing manufacturing and maintenance costs. Here the R&D work included both electrical and pneumatic drive systems.

The objective in subproject 3 was to develop appropriate new kinematics. A system of programs for computer-aided robot design was introduced among the participating industrial partners. Modular robot-axis devices were developed that can be assembled into robot systems in a task-specific manner. Furthermore, by the incorporation of results of subproject 2 it proved possible to make functional models of robot systems with new types of kinematics for assembly and palletizing tasks. Here, lightweight-construction principles using CFK materials are being applied.

For purposes of quality assurance in connection with final inspections, for the precautionary diagnosis of errors within operation, and as a necessary condition for

easy exchangeability and an equipment-independent programming of the movements of industrial robots it is necessary to have procedures by means of which the robots can be automatically measured with respect to their static and dynamic properties and can be corrected by control techniques in the event of any variations from tolerance.

In this connection, in subproject 4 various mutually complementary methods of measurement, diagnosis, and calibration were developed and successfully checked out with the participating industrial partners under actual application conditions.

The objective in subproject 5 is the development and materialization of completely new types of material-handling devices that can be classified as belonging to the border area between program-controlled industrial robots and strictly manually-operated manipulators such as are used, for example, in the nuclear-energy field; such devices are called "highly flexible material-handling systems." These devices are opening up completely new areas of application—for example, in construction and in the maintenance of bridges and buildings—and in the foreseeable future they are likely to become an economic factor on the world market. This subproject occupies a certain special position in terms of its subject matter and scope. This section of the project will not be completed until late in 1989. The results will be introduced in a separate final presentation.

A detailed report on the project is being prepared. It is expected to be obtainable early in 1989 from the Manufacturing Engineering project support group.

10-Axis Robot With Wrist Functions Developed in France

AN890062 Paris FRENCH TECHNOLOGY SURVEY in English Nov 88 pp 5-6

[Unattributed article: "RCE-1: Load Control Robot"]

[Text] AICO [Automatique Informatique COmmande] has produced the RCE-1, a robot with 10 axes slaved to a load controller which has separated travel funtions from end positioning functions. The travel function is operated by a conventional SCARA (IBM 7576) robot and the positioning function is achieved using a light wrist called Space-1, capable of perfect mastery of load and end movements somewhat in the same way as the human wrist. This wrist is based on totally new concepts and offers the possibility of creating any load combined with a movement. These quite exceptional possibilities open the way to new applications in industry. It is now possible to carry out fine assembly tasks (several micrometres), to work with a robot with minimum load so as not to damage the parts being assembled (deburring, routering), to take a 3-D reading of the contour of surfaces (to teach travel paths to routering, form checking and tracer robots).

The ten axes of the RCE-1 system are fully controlled by a modular control system (SCOM-1). This cabinet which is designed to resist extreme environmental conditions and combines intelligence with ergonomics and the flexibility required to control the handling arm, the Space-1 wrist and a complete peripheral robot environment.

France: Experimental Robot Handles Flexible Parts

AN890063 Paris FRENCH TECHNOLOGY SURVEY in English Nov 88 p 6

[Unattributed article: "Light Robot With Grab for Flexible Parts"]

[Text] The Leather Technical Center (CTC) asked the Clockmaking Technical Center (CETEHOR) and the Industrial Automation Laboratory at the French Institute for Applied Sciences (INSA) in Lyon to design and produce a prototype handling robot able to work with flexible parts.

The experimental robot has a grab with 567 suction pads that are each independent one from the other. This is the latest prototype of intelligent robots for the leather industry. The immediate applications for this machine are recognition of flexible parts after cutting, lift by the grab, and finally their methodical sorting, bearing in mind, of course, shoe sizes and left and right feet. The efficiency of the grab has been obtained by miniaturising the control elements. The total weight has therefore been kept at below 6 kg for a surface area of 300 x 400 mm.

According to the CTC, this robot for handling flexible parts is a decisive technological step in the reduction of production costs. Today parts handling still accounts for 30 percent of the cost price of a pair of shoes.

R&D on Material Endurance Test Devices

AN890066 Paris FRENCH TECHNOLOGY SURVEY in English Nov 88 p 19

[Unattributed article: "Measuring Material Endurance"]

[Text] Designed by the Laboratory of Solids Mechanics at the Institute of Technology in Lyon, Epsiflex was developed to determine the endurance characteristics of various materials such as compounds, polymers, plastics, metals, etc. This machine works in undulated sinusoidal deflection with three or four points and an imposed displacement amplitude. Two frequencies have been adopted: 12.5 Hz and 25 Hz. The sample rests on a support that can be adjusted either in width so as to work in pure deflection or shear deflection, or in height to change the amplitude of the average deformation applied to the sample. Continuous monitoring of the change in rigidity of the material is ensured by a stress sensor in conjunction with suitable electronic components.

The definition of the endurance characteristics required for analyzing the results and plotting the Wohler diagrams is made from damage criteria.

The acquisition and processing of data is ensured by software adapted to analyzing fatigue results (4 Epsiflex can be linked to a single computer).

LASERS, SENSORS, OPTICS

UK's First Ultra-Wideband Fiber-Optic Microwave Link

AN890088 Chichester EURO-TELECOM in English 10 Feb 89 p 8

[Unattributed article: "Marconi Produces Europe's First Ultra- Wideband Fiber-Optic Microwave Link"]

[Text] From its Electro-Optics Division in Stanmore, Middlesex, Marconi Defence Systems has announced the successful working demonstration of a 1 km-long 2-20 GHz optical fiber cable—the first ultra-wideband optical fiber microwave link to be produced in Europe.

This bandwidth has capacity for 3,000 television channels, or for six million simultaneous telephone conversations to travel the same strand of optical fiber. Allowing for such vastly increased telecommunications traffic along a single cable makes the new system ideal for transmissions to and from remote antennae, and for broadcasting from satellite or high definition television.

The new link uses an external electro-optic modulator in the transfer of information to the optical carrier. Developed at the GEC-Marconi Research Center, the new modulator provides more accurate transmission than links relying on directly modulated semiconductor lasers.

Biosensor R&D in the Netherlands

36980115 Rijswijk PT AKTUEEL in Dutch 7 Dec 88 p 9

[Article by Gerard van Nifterik: "Biosensor Program Intended to Develop Reservoir of Essential Basic Knowledge"; first paragraph is introduction]

[Text] As far as biosensors are concerned, there has long been a gap between the level of research and possible practical applications. Although interest on the part of business and industry has been high, for the time being there appears to be a wait-and-see attitude. Despite this, biosensors hold great promise for the future.

With the advent of the Biosensors Research Program, the many years of coordinated research into biosensors in the Netherlands appear to have a safe foundation for now. Things were different up until 1984. Up to that point, biosensor research was in most cases limited to monodisciplinary research. This situation changed over the course of the 1980s. New technologies became available, with far-reaching promises. Specifically, through the means of the Ministry of Economic Affairs (EZ) and the CME [Center for Microelectronics] in Twente, it was possible to inventory the potential know-how in the Netherlands that can be utilized for biosensor research.

Based in part on this exploratory study, the Biosensors Stimulation Program began in 1985. The organization of this program, subsidized by EZ, was in the hands of the CME. In actuality, this meant a more structured continuation of the 1984 exploratory mission. The stimulation program was intended to give biosensor activities in the Netherlands a solid nudge forward, and moreover to look into the question of whether there was any foundation within Dutch business and industry in terms of research into and application of biosensors. With respect to the former, the program, which drew to a close in 1987, turned out to be a success. Dutch business and industry displayed a great deal of interest, but for the time being saw little return in financing any type of research. Nevertheless, the stimulation program obviously provided for a sharp increase in interest in biosensors. People began to see the possibilities, and that led to enthusiasm. But the gap between potential applications and the current research situation—which is in fact very fundamental in nature—made industry hesitant to invest. "And that is not illogical," says D. Sprangers of Twente Technology Transfer BV (3T). "Moreover, it is a question of not putting too much weight on strategic research. Too much weight means not infrequently that research is pushed in a direction for which it is not yet ready. That's a waste of effort; furthermore, investments are not repaid."

Still, this does not mean that no biosensor research whatsoever is being conducted by companies. According to Sprangers, it is all but certain that such activities are under way, but under strict secrecy. As a consequence, there is no outlook on the level of development in industry.

Research Program

When the stimulation program ended last year, three things were clear: The expertise necessary for successful research is present in our country; the application of biosensors can count on a high level of interest by business and industry; and there is still little enthusiasm for private financing of research. All of these factors seemed to provide a good basis for a sound, centrally coordinated research program, even if the government had to come up with financing. And that is in fact what happened. This year, the Biosensors Research Program (OPB) got under way, a program that is intended, in a relatively short amount of time, to result in the practical application and/or manufacture of biosensors within our national frontiers. By way of the STW (Foundation for the Technical Sciences), Economic Affairs has made available a sum of five million guilders over a period of 5 years.

In the meantime, the CME—the biggest stimulator of biosensors in the Netherlands—had been split by government order into the commercial 3T and the new CME, operating on a nonprofit basis. CME continued its activities in the area of information, consulting and coordinating spearhead operations. Both organizations are involved in the research program; CME covers information and publicity, while 3T manages coordination.

There is room within the program for both research projects and feasibility studies. Despite the fact that a great deal of fundamental research must also be handled, much attention will be given to making biosensors suitable for application. Two rounds of submission of tenders are being held for the projects: one this year and one in 1989.

In order to give research a proper direction, it was assumed that the proposed projects would have to meet a number of requirements. Specifically, they must be focused on areas such as signal transmission and bonds between macromolecules and inorganic surfaces, and the characterization of the resulting surfaces of contact or connections.

Electrons

At the top of the list of the projects being honored this year is the study "Signal Transmission of Proteins to Electrode Surfaces," coordinated by Dr G.W. Canters of the University of Leiden. The foundation for this study was laid some time ago, but problems were repeatedly encountered with respect to subsidies. According to Canters, it was a question of the unusual combination of fundamental research and a multidisciplinary approach. Before the OPB appeared on the stage, there was no subsidy structure suitable for this type of research, according to the Leiden researcher. However, the research being done by Canters (who has zeroed in on biosensors, together with four scientists) has a perfect place in the OPB.

The study deals with coupling an enzyme protein to an electrode. The enzyme protein functions here as a selector, the electrode as a detector. The principle is roughly based on the fact that one starts with a redox enzyme. This type of enzyme very specifically seizes onto a particular substance while a redox reaction also takes place. This reaction involves electrons, and wherever electrons move, electrical measurements are possible.

However, there are fundamental problems. Electron transfers within the complicated enzyme protein must naturally result in electron interaction at the electrode; if not, it cannot be measured. In practice, moreover, the enzyme is fixed on the electrode, and this fixation thus provides for the transfer of electrons between the enzyme and the electrode. In short, a complex problem for which the expertise of many subfields is critically necessary. Eventually, no fewer than five working groups will be participating in the study: the Department of Chemical Pharmacy of the University of Utrecht (Dr W.P. van Bennekom), the Department of Biochemstry of the University of Leiden (Prof L. Bosch), the Laboratory for Microbiology and Enzymology of the Technical University of Delft (Prof J.A. Duine), the Department of ASKA of the University of Leiden (Prof J. Reedijk), and also from ASKA, Dr G.W. Canters. With this multidisciplinary approach, they hope to succeed in establishing the fundamental principle for the enzyme-selector biosensor. In any case, they already know how to do it. Canters: "The study is primarily focused on the mediator. This immobile mediator—another protein—provides the anchoring for the enzyme to the electrode."

The project group is using a so-called "blue copper protein" as its mediator. In the heart of the complex protein molecule there is a copper atom that receives electrons from the enzyme. This copper atom is held in place by a number of ligands. The researchers' plan is to remove one of these ligands and replace it with a special, stretched molecule that in turn sticks to the electrode. What it actually comes down to is that a blue copper protein is created with a hole in it. This is achieved through the use of advanced DNA techniques. In the meantime, the genetics of the gene in question have been mastered to such an extent that in principle one can produce the modified protein. If so, then it is a question of filling in the "hole" in the protein with an extremity of the stretched "anchor" molecule, and voila: the mediator is fixed to the electrode. Moreover, this creates a bridge for electron transfer.

According to Canters, there will be enough accumulated knowledge within one year to make a go at anchoring the mediator protein to the electrode. After that, they will take a look at the redox reaction and the bond between mediator and enzyme.

Canters says that the principle under study could provide the basis for a protosystem for various other biosensors, a system with a potentially large number of possibilities for expansion. In the future, enzyme biosensors based on the Dutch model can be used to detect a large number of different substances; this, at least, is the goal.

Reservoir

The "Signal Transmission of Proteins to Electrode Surfaces Study" broadly reflects the direction being pursued by EZ, STW, CME and 3T in the research being advanced by them. Dr Canters expresses it as follows: "In actuality, there is an effort to develop a reservoir of fundamental knowledge in the area of biosensors." It is this reservoir of expertise that will determine the success or failure of future developments in biosensors in our country.

It seems clear that there is still a long way to go. Involved is an often very complicated subject matter, about which mountains of fundamental research remain to be done before the elements of business and industry that are interested will recognize its financial attractiveness as well.

In part in order to stimulate awareness with respect to biosensors within business and industry, 3T and CME are organizing a symposium on 15 December. Of course, the keynote of the meeting will be OPB, and in particular the contrast between fundamental and applied biosensor research.

[Boxed item: "Ion Sensitive Field Effect Transistor"]

Especially in recent years, and thanks to the advent of a number of new technologies, interest in biosensors has increased considerably. Nevertheless, many of the developments are unfolding primarily in the experimental sphere. The vast majority of biosensors consist of a selector and a detector. The selector generally consists of biological (proteins, enzymes, antibodies, living cells, membranes or the like) or synthetic material (polymers, krooneters and related compounds). The selector selects one substance from the environment. The detector in turn registers the selection and emits an electric signal. Biosensors are very selective, and often of extremely small dimensions.

One of the first biosensors that provided a reasonable prospect of expansion possibilities was the ISFET biosensor [Ion Sensitive Field Effect Transistor]. ISFET (developed by the Dutchman Prof P. Bergveld) is the first biosensor in the shape of a chip. A great deal of research is being done into ISFET systems in Japan especially.

Besides chip-integrated biosensors and enzyme electrodes such as Campers', there are a number of other principles with an often very refined character. But here as well, development in the vast majority of cases is still in a fundamental stage.

Japan in particular is extremely active in the area of biosensors, although the effectiveness of the research is occasionally drawn into question.

MICROELECTRONICS

FRG: New Methods To Detect Structural Faults On Silicon Surfaces

MI890116 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 21 Dec 88 p 15

[Excerpt] [Passage omitted] Prof Martin Henzler and his colleagues at the Institute of Solid State Physics are studying faults and irregularities in silicon surfaces, even at the atomic level. As part of its priority program on "Microcharacterization of Materials and Components," the Volkswagen Foundation has approved the project, "Roughness Analysis of Technical Silicon Surfaces Extending to the Atomic Level," to be carried out by the Institute of Solid State Physics at the University of Hannover.

Semiconductor technology requires absolutely smooth surfaces because the electrons flow very close to the silicon surface of the microchips. A rough surface would decelerate the electron flow. Professor Henzler's project addresses structural faults on these silicon dice, which are used to manufacture integrated circuits. At the Institute of Solid State Physics two new methods are now combined to detect even the most minute faults. One of these is scanning electron microscopy which reveals faults even at the atomic level. In this process, a needle with a point no bigger than an atom is moved across the silicon surface at a constant distance. The needle movements are recorded and the resulting graph shows the regular or irregular arrangement of the surface atoms. However, this process can only be used to inspect very small areas. Scanning electron microscopy shows exactly what the individual fault looks like, even at the atomic level.

Electron diffraction is used to analyze somewhat larger areas. This involves projecting an electron beam onto the silicon surface: sharp reflection of the beam means a smooth surface, whereas a diffuse reflection indicates a rough surface. This method diagnoses the density and distribution of the individual faults.

The Institute of Solid State Physics is unique in the world in the precision of its electron diffraction measurements. The Hannover scientists can determine fault densities a hundred times lower than those that can be measured at other universities or in other countries.

What makes this project so special, however, is that it uses a combination of these two methods. Research is underway to establish which polishing process is best suited for obtaining smooth, fault-free silicon surfaces, or in other words, which process will rule out even the smallest scratches, even at the atomic level. At the same time, tests are being carried out to evaluate the precision of dispersion measurements. Industry is already using dispersion photometry for routine checks. This procedure is similar to the electron diffraction method. When dispersion is measured, a laser beam is radiated onto the silicon surfaces; the less luminosity visible outside the reflected beam, the smoother the surface. However, this method results in substantially less precise measurements than electron diffraction, and must therefore be enhanced by other, more costly, methods.

French Firm Develops YAG Laser Machine for Circuit Fabrication

36980107b Paris ELECTRONIQUE ACTUALITES in French 9 Dec 88 p 11

[Article: "Automatic Tin-Lead Brazing Machine Uses YAG [Yttrium-Aluminum-Garnet] Laser Firing"]

[Text] Precimeca, in collaboration with the Peugeot group, has developed a new automatic machine to braze the tin-plated copper wires used in printed circuits,

either as leads to connectors or as straps. The originality of the system lies in that brazing is carried out by firing a YAG laser, with no other changes in the traditional brazing process (soldering iron for instance).

The advantage of this process is that it is fully automated (the machine provides all connection elements) and versatile (the bridging or the wire connection can be implemented, no matter what the distance is). Each soldering operation takes about 20 ms. A trial machine, only a prototype for the moment, was installed at the Peugeot plant in La Garenne-Colombes 1 year ago and has made it possible to qualify this brazing system.

The brazings obtained have the same characteristics as those made by the traditional process. Tensile strengths of 20 N (2 kg) can be obtained with a 300-fm copper wire.

Already, Precimeca is in a position to deliver machines in a version identical to the Peugeot "prototype"; the price is about Fr500,000. The series model, taking only 1.5 seconds to complete one connection (2 brazing operations, formation of a loop, and cutting of the tin-plated wire) should be marketed by June 1989, at a price ranging from Fr1.1 million to Fr1.3 million, depending on the configuration.

Philips Develops New Power MOS Line

36980107a Paris ELECTRONIQUE ACTUALITES in French 9 Dec 88 p 13

[Article: "Philips Introduces Logic-Level Power MOS [Metal-Oxide Semiconductors] Transistors"]

[Text] Philips Components is proceeding with its program to conquer 20 percent of the European market for power MOS transistors (see ELECTRONIQUE ACTUALITES dated 12 June 1987). The company, which has invested in its English plant at Mullard-Hazel Grove and will continue to invest until 1989 a total of about Fr100 million, is marketing a complete line of power MOS transistors, referenced BUK. Consisting of transistors designed for low, medium and high voltages (up to 1,000 V), the line is aimed at industrial and automotive applications. In fact, the maximum Tj junction temperature is specified to be 175xC rather than the usual 150xC. This concerns in particular the low-voltage MOS transistors and those with logic-level control.

Fourteen logic-level MOS transistors, withstanding 50 to 200 V, have been introduced. Depending on the crystal and package size, currents will range from 10 to 40 A for 50-V, from 8 to 25 A for 100-V, and from 5 to 12 A for 200-V transistors. These products belong to the subfamily BUK-500. They can withstand peak voltages of up to 400 V. Saturation is achieved for gate-source voltages of 5 V, and their drain-source resistance can be as high as 40 mj. Three types of packages are available: the SOT-186 (insulated TO220) which will dissipate up to 30 W; the SOT-82, up to 75 W; and the TO-220, up to 125 W. The technology chosen to make these low-voltage MOS transistors will permit a cell density of 1.6 million per square inch: this is what makes for such low on-state resistance values.

13 FREDFET and for Bridge Applications

The BUK family offered by Philips Components includes also 13 high- voltage FREDFET [field-effect transistors] designed for the bridge or half-bridge structures used to control motors, UPS [uninterruptible power supplies] and converters. They belong to the BUK-600 sub-family. They are, as is known, high-speed diode MOS transistors (obtained by doping the diode). Because thes diodes are doped, they can operate at frequencies above 50 KHz. By reducing the charge stored, it is possible to reduce the diode recovery time by a factor of 5 or more (e.g. a recovery time of 180 ns for a 500-V 11-A transistor).

The BUK-600 family consists of products that will withstand from 400 to 1,000 V; they are offered in TO-220, SOT-93 and SOT-199 packages.

Siemens Aims For Increased International Competitiveness

36980107c Paris L'USINE NOUVELLE in French 24 Nov 88 pp 21- 24

[Article by Michel Dabaji and Jean-Pierre Jolivet: "Siemens: The Giant Wakes Up"]

[Text] **Caught in the maelstrom of concentrations, Siemens reacted and launched an unfriendly takeover bid. A first for the group, which just started the largest restructuring in its history. The goal: to get more bite.**

A bolt from the blue, last Thursday, in the sky of European electronics: Siemens, allied with the British General Electric Company (GEC) is launching the first takeover bid in its history: against Plessey, the British specialist of telecommunications and defense electronics. What a shock to see the German giant, with 356,000 people the largest employer on the other side of the Rhine, dressed up as a "raider," when it had always preferred internal growth!

Caught as it was in the whirl of large-scale European industrial restructuring, could Siemens—the seventh electrical engineering and electronics company in the world and the first in Europe, ahead of Philips—just do nothing?

Siemens and GEC patiently developed their plan before launching their Fr18-billion takeover bid (one of the largest in Europe) that should give them each 50 percent of Plessey. The financial packaging is subtle. It is designed so British authorities cannot block it, as they did in 1985 when GEC launched a solo attack against Plessey.

Asset

This time, telecommunications are the major facet of the operation launched by Siemens. If it succeeds, the German company will gain a foothold on the British market, with a 40-percent interest in GEC Plessey Telecommunications (GPT), the joint subsidiary of GEC and Plessey created last March (Fr13 billion; 80 percent of the British public switching market). That would represent a significant asset for Siemens, as it is planning—like its competitors—to invest over Fr10 billion in the development of next-generation telephone exchanges.

As a counterpart, GEC would acquire a 50-percent interest in Siemens's defense electronic activities, which represent Fr1.5 billion. This is a politically sensitive side of the operation; however, for Lord Weinstock, chief executive officer [CEO] of GEC, it is a prerequisite to the new deal which is now taking place in the European defense industry. But Plessey will retain its industrial and marketing independence in Europe. GEC would take over 51 percent of Plessey's interests in North America (Sippican in the United States and Leigh Instruments in Canada).

For all that, Siemens will not neglect the components activities of Plessey. Following the acquisition of Ferranti's semiconductor division, the British company's components sales have reached Fr1.5 billion, with close to Fr1 billion from semiconductors. Although already a party to large European cooperation agreements with Philips and SGS Thomson (in the JESSI program [Joint European Submicron Silicon Initiative]), Siemens would like to extend its cooperation to include the British company Plessey. This is a priority sector for the German company, which has made a huge effort (Fr6 billion over 4 years, and a continued deficit) to remain in the race.

If the operation succeeds, GEC will become a privileged partner of Siemens. And the operation might prefigure an extension of their cooperation to the electrical engineering or medical sectors. And now that Siemens is on the move, there is no saying that it will not launch other operations of similar scope. The outcome of the invitation to bid for the Spanish TGV [high-speed train] should enable it to settle for good in the Iberian Peninsula. And this worries the other European electronics manufacturers, Thomson, Alcatel, Philips, MATRA [Mechanics, Aviation and Traction Company] and ABB [ASEA [Swedish General Electric Corporation] Brown Boveri]. Especially considering that neither Siemens nor GEC lack the money to engage in battles on the Stock Exchange. Siemens has a Fr78-billion war chest, and GEC Fr14-billion! Another reason to watch out.

In telecommunications, Siemens is the third largest company in the world, behind AT&T and Alcatel; the Siemens-GEC partnership would represent nearly Fr60 million, which would place it closer to Alcatel (Fr80 billion), the European leader. This would be an ominous advance. Already represented in Italy (16 percent of the market) following the acquisition of the European operations of the U.S. GTE, Siemens still hopes to enter into a joint venture with Italtel... thus gaining access to the Italian telephone market, which is just in the middle of modernization. In Spain, the German company is also looking out for opportunities, in particular in the radiotelephone business.

Siemens is equally watchful in the professional electronics sector. Thomson, the French leader, tries to find European partners in each of its major branches of activity and is currently negotiating an alliance with Plessey in the field of on-board sonars. If the Siemens-GEC takeover bid succeeded, this project might be compromised.

Changes

It is quite a surprise to see Karlheinz Kaske, chairman of the Siemens board of directors, start to act like the former CEO of CGE, Georges Pébereau, buying the ITT telecommunications branch, or like Alain Gomez, CEO of Thomson, setting his heart on Mostek and RCA. What a change in the supposedly set methods of this engineering company with sales of Fr200 billion! When its competitors were multiplying takeovers, Siemens was developing its activities: internal investments and expertise in its own technology were always its credo.

This change in methods was expected since Karlheinz Kaske started reorganizing the 356,000-strong group. For the 60-year-old physicist imbued with the culture of Siemens, where he has already spent 38 years, that was a titanic job, commensurate with the huge size of the group... True, he suddenly became aware that there is danger in opposing change. In March 1988, he informed the general assembly that the dividend would be reduced from DM12 to DM11... bringing down upon himself the wrath of the Siemens family which owns 10 percent of the stock. Challenged, the chairman of the board had to react.

Last July, he sent a letter to the group's management. It was only the prelude to the largest reorganization ever in the 141-year history of the colossus with the 312 trades. The goal of the reorganization which started last October was to decentralize. From top to bottom, structures are being broken up, beyond the worst fears of the apparatus men. Of the 31 members of the board, only about 10 will remain. Central departments will be increased from five to seven, not including KWU [Power-Plants Union] which will remain separate. And the 7 divisions will be broken down into 15 specialized independent units. A major cleanup that will not remain without consequences: there is already some talk of 4,000 layoffs around Munich.

In his reorganization, Karlheinz Kaske was guided by two major criteria: getting closer to the end user; being flexible enough to reflect variations in the demand. In all

cases, activities which progress faster must be separated from those which progress slower or even regress. Thus, the components division was divided into two entities: semiconductors, and tubes and passive components. Similarly, the automobile and assembly-line automation entity was separated from the electrical installation division. That is normal: automotive electronics was defined as a priority, together with components, telecommunications and automatic-control devices. And two acquisitions made last July (Ken in the FRG and, above all, Bendix in the United States) have propelled Siemens to the third rank worldwide for automotive equipment, behind Bosch and the Japanese Nippon Denso.

Karlheinz Kaske thus decided to go ahead full speed because he wanted to fight the sluggishness of a group which, even in Germany, was described as a sleeping giant. He also wanted to improve the productivity of his personnel, which was judged inadequate. "Between 1984 and 1987, it even declined by 2 percent every year, while it increased regularly at all its European or U.S. competitors'," Patrick Legland, the electrical engineering specialist of SAFE, the market research department of Paribas and Credit du Nord, explained. A worrying "warning light" that warranted starting massive personnel- reduction programs. At the Munich components plant, for instance, where 1,000 were laid off this year.

That very sluggishness was the cause of Siemens exclusion from the French telecommunications market. AT&T and Ericsson had been refining their case for a takeover of CGCT [General Telephone Engineering Company] for a long time when Siemens woke up, too late. Despite the arrival of Christian Fayard, former manager of the public switching division of CIT-Alcatel, at the helm of Siemens France, and despite intensive last-minute efforts, MATRA's Swedish partner carried it off. Nine months later, the German Bosch was taking over the telecommunications division of Jeumont-Schneider... despite the fact that the latter was a partner of Siemens in the takeover of CGCT!

We might also say that Siemens "failed" in electrical engineering, since it remained strangely absent from the war of movement that has disrupted the sector in the past 2 years. This is an important point, as electrical engineering happens to be the activity from which the group issued. Its "historical heart" still counts for much: one fourth of its sales (not including electrical installations and lighting), which makes Siemens a very strong No. 2 worldwide, on a par with the U.S. General Electric, behind the Swiss-Swedish ABB. Electrical engineering made the group rich, but its margins crumbled away slowly as a result of the stagnation of electric power plant orders and the resulting overcapacities.

In this field, where orders still come from public bodies, only 15 to 20 percent of the contracts are awarded to foreign groups. Therefore, local facilities are a must. And the Swedish ASEA proved quicker in this strategy, federating companies with a vengeance so as to be represented on all markets. It espoused the Swiss giant Brown Boveri (although the latter was geographically and culturally Siemens's neighbor) and redrew in its favor the whole map of European electrical engineering, and then it made a forceful entrance on the U.S. market through a partnership with Westinghouse. Finally, it just swiped the AEG [General Electric Company] steam turbines in Germany (so to say right under Siemens's nose) and then, last week, it took over the entire Italian company Franco Tosi, thereby acquiring a strong option on Italy's giant, the publicly-owned Ansaldo (Fr10 billion in sales). Everybody, Siemens included, had negotiations going on with Ansaldo, just as, 2 years ago, with Brown Boveri!

Siemens remained very reserved, even when other foreign companies came to hunt on its territory. The French Alsthom, for instance, which just acquired a 45-percent interest in Man Energie; or again ABB, already No. 2 in the FRG. Is it inertia or too much confidence in its power and its all-German technology? Not just that, Patrick Legland pointed out: "Siemens considers that its electrical activity is on the right track and will not be weakened easily, as it chooses to focus its efforts on electronics and telecommunications, where margins are higher—4 to 6 percent, compared with 2 percent in electrical engineering."

Who could push around this Fr60-billion colossus which is represented in all segments of electrical engineering? Even though it is not the leader in all of these segments (Leroy-Somer is ahead of Siemens for small- and medium-power industrial electric motors), it is resting on solid bases.

One example: railroad equipment. The German group is not as lucky as Alsthom, which is alone on its domestic market. The CGE subsidiary actually took over Jeumont-Schneider's railroad-related activities and thus became the world leader. Siemens, on the other hand, must count with two German competitors. Therefore, it puts forward its technology, which will be a precious help in getting a significant part of the contract to modernize the Spanish railroads. This will enable it to remain among the world leaders and to wait for a resumption of large export contracts.

And it is off to a good start: all it had to do was to make use of its financial power and German political clout, and it is about to get a nice, if not the nicest, chunk of that "fabulous" contract (Fr4.5 billion for the first instalment) and its sequel, the restructuring of the two Spanish national railroad companies. And, together with it, the (strategic) label of world TGV coleader.

Similarly, all it had to do was to sign an agreement with ABB on high- temperature reactor technology (HTR), and its KWU department became a major potential operator on the Soviet nuclear market, one of the most

promising in the world. An excellent operation for Siemens who, contrary to the French, did not benefit from the fantastic domestic market that would have enabled it to write off its development efforts and to start exporting under favorable conditions.

Strong Point

Siemens is No. 2 worldwide in process control and regulation (behind Honeywell), in programmable controllers (behind Allen Bradley) and in numeric control; it is the only manufacturer also represented in data processing: to develop its activities in the CIM (computer integrated manufacturing) and integrated-network controller management sectors, it does not have to look for a partner, as Allen Bradley and Télémécanique just did (with DEC and IBM).

Finally, a few months ago, its technology enabled it to sign a "splendid" agreement with Westinghouse, which will throw wide open before it the doors of the disseminated U.S. market for programmable controllers: Westinghouse will distribute its line in a sector in which the market, although small and difficult, is very profitable for Siemens. That is because, next to its programmable controllers, Siemens is offering its automation components, for which the market is four times larger (Fr60 billion worldwide), and Siemens is the world leader.

The Munich group does sign a lot of agreements. Why, then, does it give the impression that it does not seize opportunities the way its competitors do? According to an expert: "Siemens could not adopt the international strategy of a company like ABB. That is because ABB is perceived as a multinational federator, while Siemens is too much of a German company." So much German that when a company becomes part of the group it knows that, sooner or later, it will become German. And this perception plays against the group during negotiations...

For this reason, Siemens has always "found it hard" to grow by acquiring other companies: 50 percent of its sales come from Germany (75 percent from Europe). And, above all, it produces in deutsche mark: 70 percent of its personnel is based on the other side of the Rhine... Yet it ranks as the leading European employer! In France, for instance, Siemens accounts for only 2 percent of the market for electronics and electrical engineering together. For years, its management has said that it should increase its share. But nothing happens. Even though Siemens's hand can be seen every time stock from that sector is bought on the Stock Exchange. For instance, a few month ago, before the takeover bid on Télémécanique; or, more recently, when there were some transactions involving the stock of De Dietrich, the Alsatian manufacturer of household appliances which is also represented in the railroad equipment sector.

Worse still, the slightest turnaround in economic conditions has strong repercussions on its activity. The 1988 results just published by Siemens thus show that its growth was due to its foreign activities (+15 percent). Germany stagnated (+2 percent only): even the Bonn government is concerned, as it is determined to take steps to revive domestic demand for durable goods.

Too weak outside its domestic market, Siemens must strengthen its positions in Europe. From now on, Karlheinz Kaske will apply himself to do just that. Whether the takeover bid for Plessey succeeds or not.

The Opposing Forces

	Plessey	GEC	Siemens
CEO	John Clark, 60 (since 1970)	Lord Weinstock, 63 (since 1963)	Karlheinz Kaske, 60 (since 1981)
Personnel	30,000	156,000	356,000
1987 Sales	Fr14 billion	Fr59 billion	Fr200 billion
1987 Profits	Fr1.85 billion	Fr 7.6 billion	Fr4.76 billion
Sales Growth Rate, 1986/1987	-7.3 percent	+5.5 percent	+16 percent
1987 R&D Investments	Fr3 billion	Fr7 billion	Fr22 billion
1987 Non-Domestic Sales	31 percent	22 percent	48 percent

Comparison With International Giants

(Sales in Billion of Francs)
- Source: L'USINE NOUVELLE

	Telecommunications	Electrical Engineering	Medical	Semiconductors	Defense
Siemens	45	60	18	3	2.6
GEC	7	18	35	0.3	22
Plessey	6	-	-	0.9	2.7
Sales, together	58	78	21.5	4.2	27.3
Rank, together	3	2	1	13	3
Weight of competitors	AT&T(87)	ABB(90)	Philips(8.5)	NEC(19.14)	Hughes(38)
	CGE(77)	GE(60)	GE/CGR(4.4)	Toshiba(17.64)	Thomson(28.2)
	Northern(31)	Hitachi(60)	-	Hitachi(16.68)	Raytheon(27)

Like GEC, Siemens must gain market shares and strengthen some of its positions in the world ranking.

JESSI Project Reviewed By European Chip Makers

Green Book Plan

36980122a Rijswijk PT/AKTUEEL in Dutch 11 Jan 89 p 1

[Text] The European chip project JESSI [Joint European Submicron Silicon] will cost 8.5 billion guilders. JESSI is a research program being carried out as part of Europe's EUREKA technology program. The program will run through 1996 and its purpose is to secure Europe's position in microelectronics. One third of this sum will go to develop the technology for chips with units of 0.3 microns, ⅓ for applications of a European computer system for mobile communications, and ⅓ for basic research and the development of production equipment for a new generation of chips.

These figures appear in the Green Book which was sent last week to the JESSI advisory committee, later than planned. This committee includes the major European chip producers, Philips, Siemens, and SGS-Thomson. Other computer manufacturers and scientific institutions are also represented on the committee. In early February the advisory committee will announce whether it agrees with the Green Book. At that time it will also be necessary to arrange for the program's financing. The core team of the planning group that is coordinating JESSI hopes that the governments will pay for half of the industrial research and all of the research in scientific institutions. In principle, the governments of the Netherlands, West Germany, and France are prepared to contribute. They have not yet made any announcement about the exact figures.

Microelectronics Leaders to Collaborate

AN890060 Paris FRENCH TECHNOLOGY SURVEY in English Nov 88 p 1

[Unattributed article: "JESSI: Tomorrow's Electronics!"]

[Text] The directors of Philips (Netherlands), Siemens (FRG) and SGS-Thomson (France-Italy) have just agreed to participate in the JESSI [Joint European Submicron Silicon Initiative] program aimed at developing future memories. An investment of $6 billion has been earmarked for the development of the new generations of memories and future technology applicable to semiconductors.

Philips will produce static memories, Siemens will develop dymanic R/W memories. SGS-Thomson specialized in microelectronics will contribute their know-how in the area of semiconductors.

At present there are a certain number of outstanding questions, such as: What role will industry play and what funds will European governments be prepared to contribute? It might be pointed out that Japanese companies invest some $2.5 billion in R&D in the electronics sector. In the United States, the SEMATEC (IBM and AT&T) Center has an annual budget of $100 million.

The JESSI program is a necessary step in attaining production investments in Europe.

JESSI Cooperation Described

3698M111 Paris ETI ELECTRONIQUE in French 14 Nov 88 p 5

[Text] Philips, Siemens, and SGS-Thomson have finally agreed to pool their research for the electronic components of the future. This cooperation, which will be take place within the EUREKA program JESSI [Joint European Semiconductor Silicon], is expected to receive financial support amounting to more than Fr 20 billion from the three companies involved, as well as from the Netherlands, the FRG, France, and Italy. This cooperation, which is structured along the lines of Sematech, an association set up by U.S. manufacturers last year, will focus on the development of submicron technology (between 0.5 and 0.3 micrometers) and will require a yearly investment of Fr 2.5 to 3 billion over the next 7

years. Each company will exploit the results of research in its own field of specialization: static RAM for Philips, dynamic RAM for Siemens, and EPROM for SGS-Thomson.

The first stage, lasting until 1991-92, will focus on 0.5 micron technology to achieve 16 Mbit memories. The following stage (1995-96) is expected to lead to the development of 64 Mbits with 0.3 micron technology.

European Chip Makers Lose Ground in World Competition

36980122b Rotterdam NRC HANDELSBLAD in Dutch 1 Feb 89 p 15

[Article by Staff Writer Dick Wittenberg: "European Chip Makers Continue To Lose Ground"]

[Text] Paris/Munich, 1 Feb—Will the European chip industry never stop losing ground? In the list of the world's top twenty semiconductor manufacturers, Philips fell from 7th to 10th place last year, the Franco-Italian SGS-Thomson combination slid from 13th to 14th, and Siemens tumbled from number 16 to 20. Once again the European share of semiconductor production dropped from 11 to 10 percent. And again Europe's share in chip consumption declined from 19 to 18 percent.

Jeanne-Philippe Dauvin, his head full of figures and his eyes full of fun, has cheerfully calculated all this out: Japanese manufacturers booked an average sales increase of about 40 percent, well above market growth. The Americans were just below that, with 32 percent. And then there were the Europeans, with under 20 percent, a score that was so low primarily because of Philips' mediocre sales growth.

Nonetheless, not too much should be made of last year's poor sales growth, says the director of market research of the Franco-Italian SGS-Thomson combination. "After all, 1988 was a very special year, it was the year of the dynamic memory and special microprocessors." Together these two types of chips made up only about one third of the market but in 1988 they provided the lion's share of the growth. And because the European firms have a very small share of precisely that portion of the market, they profited less than the average from the growth in sales.

Dauvin's colleague Karlheinz Weigl, marketing director of Siemens' semiconductor division, has yet another explanation. He says that last year growth was particularly strong in the market for computer chips. But the Europeans are underrepresented in that segment too. In telecommunications, the part of the market where Europe has traditionally been very strong, demand for chips grew by only 4-5 percent.

Apart from dynamic memories and special microprocessors, the semiconductor market grew by less than 20 percent last year, says Dauvin. He then notes with great satisfaction SGS-Thomson's 26.1 percent growth in sales. His inevitable conclusion: "We did really tremendously well."

Obviously the Frenchman is not troubled by false modesty. Light-heartedly he describes the merger a year and a half ago of Italy's SGS Microelettronica and of the semiconductor division of France's Thomson-CSF as "one of the best things that has happened to Europe in years." Separately the two firms would have no long-term hope of survival. But together they form a perfect combination. Together they are, Dauvin says, "a winning team," solid and sure.

In any case, under the leadership of inspiring Board Chairman Pasquale Pistorio, SGS-Thomson has been able to eliminate its large losses. In 1987, the combination ended the year over $200 million in the red, last year the firm reached the break-even point. Thanks to extensive restructuring, sales per worker have grown by almost 50 percent since the merger.

But at least as important, says Jeanne-Philippe Dauvin, is the fact that last year SGS-Thomson broke through and surpassed by almost 10 percent the magic sales figure of $1 billion. That sales volume is considered a sort of "critical mass" required if a firm is to be able to continue to compete as an equal in the chip industry. "It is the first time in history that two European firms have reached that boundary," says Dauvin, almost triumphant. "SGS-Thomson doubles Europe's chances of surviving in the semiconductor industry."

SGS-Thomson's final goal: to win a place in the top 10, conquering a market share of at least 4 percent. According to Dauvin that is by no means too ambitious. "If we continue to grow at the same rate as in the past 7 years, we'll reach that goal in 1992." By extrapolation, sales would then be almost $2.4 billion.

Siemens, the third largest European chip maker, is far from that point. To be sure, the Germans too have doubled their sales in the past 5 years, to $784 million, and they too were able to reduce their losses last year. But they still have got to spend hundreds of millions of D-Marks on chip production. That is the high price that the group is paying for a place in the semiconductor market. And Siemens depends on the European market for 70 percent of its chip sales.

In the eyes of marketing director Karlheinz Weigl, these are no more than start-up problems. He says that Siemens is working hard on a more balanced package of products, is achieving outstanding results with dynamic memory chips, and is striving for a more balanced geographic distribution of sales. And the firm will soon reach that "critical mass," says Weigl. Through acquisitions or on its own.

With semiconductor sales of $1.7 billion, Philips has long since passed the magic boundary. It can also boast of a strong presence in the United States through its subsidiary Signetics. And Philips is making a profit on its chip production. But will Philips' chip division continue to do so well? Last year sales growth was strikingly low, at 10.1 percent. Philips is unwilling to offer any explanation for these figures until it presents its annual figures at the end of this month.

Will the European chip industry never stop losing ground then? Karlheinz Weigl is not so pessimistic on this point. He thinks that Europe's luck will change one day. For example, because chip use in telecommunications will increase rapidly in the near future. That is an area where Europe has always been strong. Weigl also continues to believe that the European computer industry will recover. And he hopes that JESSI [Joint European Submicron Silicon], the European cooperative program for producers and users, will strongly stimulate chip applications.

According to Jeanne-Philippe Dauvin, Europe has yet another ace up its sleeve: consumer electronics. In 4 years a television set will have just as many memory chips as a personal computer does today. That is an enormous potential market. Dauvin: "Europe still has every chance."

NUCLEAR ENGINEERING

EC Approves Controlled Nuclear Fusion Research Program

3698M026 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 486, 29 Aug 88 pp 12-13

[Text] The EC Council of Ministers has approved a research and training program in the field of controlled nuclear fusion and intends to make ECU735 million available from 1 January 1988 to 31 March 1992. The following individual research and training objectives are to be pursued:

1. The main aims of the program are:

- To establish a physical and technological base for detailed planning of NET [Next European Torus]; in the field of physics and plasma technology, this includes fully exploiting JET [Joint European Torus] and various medium-sized specialized tokamaks already existing or under construction, while in the field of technology, it includes expanding current fusion technology programs;
- To begin detailed construction design for NET before the end of the program's lifetime, although not before the next program revision, when the necessary data base will be available;
- To investigate the reactor potential of some alternative construction types.

The program consists of:

a) Plasma physics in the nuclear fusion field, especially basic research in plasma confinement, using the appropriate equipment, and in methods for creating and heating plasmas;

b) Research work on the confinement of hydrogen, deuterium, and tritium plasmas in closed configurations for broad ranges of thickness and temperature;

c) Research on the interaction of light, material, and transport phenomena, as well as research on the development of high-performance lasers;

d) Developing effective plasma heating methods and applying them in confinement facilities;

e) Improving measuring methods;

f) Preliminary design of the next stage and, if possible by the next amendment to the program, the beginning of detailed construction design—which should profit from the work done on conceptual designs for NET and also ITER [International Thermonuclear Experimental Reactor]; in addition, technological research on the planning and construction of the next-stage fusion reactor, as well as the necessary long-term developmental research;

g) Expanding the JET facility to full capacity, running and using JET;

h) Studying the feasibility of fusion, including environmental tolerance, safety, and economic viability.

The work cited above under the letters a), b), c), d), e), f), and h) is to be carried out in the framework of partnerships or time-limited contracts. All future research at the Joint Research Center in the field of NET and fusion technology is to be taken into consideration.

The realization of the JET project cited under letter g) was the responsibility of the JET joint enterprise set up by Euratom Resolution 78/471.

2. The program described under No 1 is one of long-term cooperation that includes all the activities of the member states in the field of controlled magnetic fusion. In time, it should lead to the joint preparation of prototypes for mass production and marketing.

3. The sum of ECU406 million, considered necessary to carry out the program (excluding JET), includes the financing of:

a) Priority projects—about 45 percent of the cost of the work described under No 4;

b) Current expenses of the partnerships—about 25 percent of the cost;

c) Certain industrial contracts in the field of NET fusion technology and the development of advanced plasma heating methods—100 percent (see No 4);

d) Administrative costs and expenses to ensure mobility of personnel carrying out the program as well as the NET team, and to finance a special stipend system in conjunction with the fusion program;

e) Operational costs of the NET team—up to 75 percent;

f) An evaluation of the program by independent experts as well as an evaluation of the environmental, security, and economic aspects of fusion;

g) According to a hearing of the fusion program advisory committee: cost-sharing contracts with groups in member states not involved in partnerships for special research expenses—about 25 percent of current expenses and about 45 percent of research-specific capital expenditure.

Each contribution from third-party countries (Sweden and Switzerland) to the program, excluding JET, shall be applied to the expenses mentioned above for the financial benefit of the EC.

4. According to a hearing of the fusion program advisory committee—see No 3—the Commission may finance projects in the following fields for a total participation rate of about 45 percent:

a) The Tokamak system and financing for JET;

b) Other toroid installations;

c) Heating and injection;

d) NET and fusion technology.

If these projects belong to categories c) and d) and are carried out by industry, the Commission can finance them up to 100 percent—see No 3 c).

All partnerships have the right to participate in the experiments carried out with the facilities and equipment set up for this activity.

5. The total contributions of the members of the JET joint project for JET expenses during the time the program is running are estimated at ECU440 million. They should cover the expansion of the JET facility to full capacity, as well as its operational costs. In accordance with the JET charter, 80 percent of this sum, i.e., ECU352 million, will be financed by the EC budget.

This sum is estimated to be financed as follows:

—ECU329 million from the means available for the JET program;

—ECU23 million for the participation of Sweden and Switzerland in JET via the EC budget.

FRG Nuclear Research Center Develops New Plasma Purification Method

3698M019 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 483/484, 15 Jul 88 p 13

[Text] Expensive, long term research programs are being carried out all over the world for the technical exploitation of the nuclear fusion that takes place in the sun. For this purpose, a plasma must be produced at more than 10 million degrees and enclosed in magnetic fields. However this status is not permanent and at the border of the plasma, there are cases of "interaction" between the particles and the walls of the vacuum container. This causes the material to erode resulting in the contamination of the fusion plasma. Such impurities must be carefully limited if the necessary conditions for producing usable energy are to be achieved at all. The maximum limit for heavy impure atoms such as metals is much lower than for lighter elements such as carbon.

A process for coating the inner wall with a boron carbon film has been used for the first time in the TEXTOR fusion experiment at the Juelich Nuclear Research Center. This process makes it possible to produce fusion plasmas with an improved degree of purity. The special mechanical properties and the stable temperature of boronized films can also be applied outside of fusion research.

Researchers at the Center's Institute for Plasma Physics reported the first results of the new process at an international conference held in Juelich.

Based on preliminary work carried out at the University of Zurich, the process was developed for the TEXTOR project with Swiss contract partners. The process involves the homogeneous, plasma-chemical coating of the entire inner wall of the vacuum container with thin, amorphous films with a surface of approximately 40 square meters. The films primarily consist of boron and carbon. This boronization is a further development of the Juelich carbonization process in which thin, amorphous, diamond-like layers of carbon are applied to the surface.

Metallic plasma impurities were completely suppressed by carbonization. However a relatively small, yet troublesome problem remained: the carbon impurity of the plasma—particularly the impurity caused by chemical reactions between the film and plasma particles forming hydrocarbon molecules, and by carbon monoxide formation with residual traces of oxygen. As demonstrated in the TEXTOR experiment, this problem could largely be solved by boronization. The response of conference

participants showed that boronization—as was the case with carbonization until now—will probably be applied extensively in fusion reactors worldwide within a short time.

In boronization, a gas mixture of boroethane, methane, and helium flows through the vacuum container and a glow discharge is lighted. This causes fragments of these gas particles to be shot onto the wall. If the gas mixture, wall temperature, and the electric current and voltage are chosen correctly, a boron carbon layer will be formed on the wall. To date a layer about 1/20,000 mm thick has been used in TEXTOR.

Compared to the "diamond-like" layers generated in carbonization, the boron carbon films also have special mechanical properties such as great hardness and resistance to abrasion as well as good adhesive strength on metallic bases, although these properties are accentuated by improved temperature stability. Beyond fusion research, these characteristics could lead to a wide range of applications as abrasion-resistant protective layers.

Program To Dismantle European Nuclear Facilities Proposed

3698A339 The Hague TECHNIEUWS EUROPA in Dutch Sep 88 p 31

[Unattributed article: "Proposal for 5-Year Program To Dismantle Nuclear Plants"]

[Text] The European Commission has submitted a program proposal to the EC Council for research on the dismantling of nuclear plants. Together with specific projects on radiation protection, radioactive wastes, and so on, the program would be conducted as part of the 1988-1992 R&D Framework Program. The program will receive approximately ECU 32 million in EC funding, mainly to support projects on a 50/50 basis. The EC has been sponsoring research into dismantling technologies for several years. The need for such technologies is obvious: In 1979, five nuclear plants were shut down; currently, 17 are in the process of being dismantled, and, by the year 2000, this number is expected to rise to 50. In addition, related facilities such as reprocessing plants will also have to be closed down.

The program will concentrate on testing dismantling technologies currently in practice. Several pilot projects will be started up to this end in Great Britain, the FRG, France, Belgium, and other countries. Other parts of the program concern research into:

- the long-term reliability of premises and systems,
- decontamination techniques,
- treatment of specific materials (concrete, granite, steel),
- application of semiautonomous systems for manipulating radioactive materials,
- the volume of wastes resulting from dismantling activities.

The study will examine the possibility of using technologies to design new installations that produce minimal exposure during dismantling.

SCIENCE & TECHNOLOGY POLICY

1988 FRG Research, Development Budget Reported

36980108b Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 15 Dec 88 p 8

[Text] Cologne—Last year the expenditures for research and development in the FRG were a good DM 54 billion. This is from a report by the German Economic Institute (IW), Cologne. It says that this amounts to 32 percent of total capital expenditures on equipment. This, it says, although the FRG is distinctly behind the Americans in this regard (41 percent), it is roughly on a level with its strongest European technology-competitors, France (32 percent) and Great Britain (29 Percent). According to data of the institute, in the FRG businesses provide the largest research contribution. It says that these account for about 67 percent of all national research and development expenditures. This value is surpassed only by Japanese businesses, which will finance about 75 percent of all such expenditures. It says that in the United States and Great Britain the corresponding percentage is markedly below 50 percent. In these countries the defense departments above all are the originators of research. In the United States just under two thirds of the public research expenditures will pertain to the defense area, whereas in the FRG the corresponding sum is only about one tenth of total research expenditures.

Success of Regional FRG Research Centers Analyzed

Problems Facing Technology Parks

36980091 Duesseldorf HANDELSBLATT in German23 Nov 88 p 26

[Article by Dr Rolf Sternberg, Assistant Professor of Economic Geography, University of Hannover: "Agglomerated Areas Offer the Best Chances for Successful Research Parks"]

[Text] The building of technology and start-up centers (TGZ's) in the Federal Republic of Germany in the early 1980's can only be understood in connection with the crisis in promotion of trade and industry during that period.

A drastic reduction in inter-regional mobility for growth firms made successful recruitment for relocation increasingly unlikely. One solution to this problem has been found in the intensified attention paid to assets of firms already established in a region, including the founding and support of local start-ups. Additional structural factors which made TGZ's seem to be the appropriate

solution to local economic problems were the "discovery" of small and middle-sized firms as a "new" target group for state funding, the increased reliance on technology-intensive goods and services to assure competitiveness in the total economy, and, last but not least, the goal of eliminating the qualitative deficit in start-ups noted in the late 1970's in the FRG compared to other Western industrialized countries.

In Berlin and Munich, in Essen and Saarbruecken, and even in Gronau and Syke, a TGZ seemed to be the solution to specific economic problems, especially since very early on the significant roll of "science parks" in the genesis of such a world-renowned high-tech agglomeration as "Silicon Valley" was quite uncritically introduced into the discussion of FRG TGZ's.

U.S. Models Not Transferable

Only later, and then all the more painfully, did it become clear that the truly fantastic success of a few U.S. parks had been achieved under entirely different structural conditions and that it was therefore necessary to warn against a simple transfer to FRG structures. In any case, there are still no "genuine" research parks here.

The initiators of the TGZ's advertised and continue to advertise three goals in particular in their programs:

- Encouragement of innovative start-ups.
- Creation of professional jobs in the region in question.
- Practical application of research results.

An empirical analysis of 31 TGZ's and 177 of the firms located in them has permitted the author to make a representative current assessment of these comparatively young instruments of community promotion of trade and industry. (R. Sternberg: "Technologie- und Gruenderzentren als Instrument kommunaler Wirtschaftsfoerderung," Dortmunder Vertrieb fuer Bau- und Planungsliteratur, 1988).

Using consulting and other services which reduce fixed costs (favorable rents and shared service facilities, in particular), the TGZ management attempts to increase the likelihood of survival for technology-based start-ups. The generally supportive function of the TGZ's is unequivocally affirmed by the entrepreneurs interviewed. Most frequently mentioned were the lower overhead costs as well as the potential for informal contacts with other new entrepreneurs in the same building, the latter has in fact already led to awarding of contracts within the centers for 40 percent of the firms. Whether their location in a TGZ can reduce the high insolvency risk for technology-oriented start-ups cannot be determined as a rule until 5 years after their founding.

It does seem certain that at the time of the investigation the targeted clientele, i.e., technology-oriented start-ups, actually constitute the majority of TGZ renters. The technological orientation of the TGZ firms is higher than average. The gross direct effect on employment of the TGZ's includes the employees in TGZ management (132 persons in the 31 TGZ's) and those in the firms investigated (2,308 persons), for a grand total of approx. 2,500 employees in the TGZ's analyzed. These numbers clearly show that fundamental stimulation in employment should not be expected even in the intermediate term from the TGZ's, which primarily house extremely small firms.

Technology Parks Have Not Fulfilled All Hopes

On the other hand, the hopes for raising the qualification level of the regional job pool have already been partially fulfilled: The proportion of university graduates in the TGZ firms is 44 percent.

Almost 75 percent of the firms have contacts with regional R&D facilities (universities, professional schools, private R&D facilities). These contacts range from general transfer of information to acquisition of personnel. Forty-three percent of the TGZ entrepreneurs recruited at least part of their personnel in this manner and thus chose personnel transfer as the most efficient form of technology transfer.

However, it seems rather unlikely that the TGZ facility itself can force technology transfer between R&D facilities and companies outside the TGZ, although half of the TGZ managers see their TGZ as a technology consultation facility for firms not located in the TGZ. The competition seems too great in the technology transfer market, where a broad palette of other suppliers such as instruments of the IHK's [Chambers of Industry and Commerce] and the universities are already hustling.

More significant than such real economic effects are the so-called climate and image effects, from which the communities with a flourishing TGZ profit. The result of this strategy, also observed abroad, of polishing the city's image through a TGZ which is at least associated with high-tech can in many places be seen as the latest version of the competition between mayors, which now involves TGZ's instead of churches and indoor swimming pools. Naturally, this effect largely resists measurement with regional demographic methods. Currently, the majority of TGZ's seem to be profiting from the positive image of measures for the support of technology and their results, instead of the TGZ's themselves being identified as the cause of the climate effects referred to above.

After almost exactly 5 years—Berlin's BIG [Berlin Center for Innovation and New Enterprises] opened its doors in November 1983—TGZ's in the FRG have given business promoters, TGZ managers, and entrepreneurs a great deal of informative experience with this new instrument. There is no doubt that they have not fulfilled all hopes everywhere. Nevertheless, TGZ's are a

significant instrument within the framework of a comprehensive concept of community and regional economic and technological promotion, which must absolutely be complemented by other instruments. The problems of the TGZ fall in particular into the areas outlined below:

- Park management requires experienced, full-time personnel familiar with the problems of technology-based start-ups; such personnel are not available in all TGZ locations.
- Acceptance outside the TGZ of the firms continues to suffer under the subsidy-tarnished image of many TGZ's, a fact which brings real disadvantages for the entrepreneurs in question in acquiring orders. So far only a few TGZ's are seen as "good addresses" by potential customers.
- Firms excluded from TGZ'z because of their growth can only give rise to greater regional effects, e.g., in the labor market, if suitable sites can be provided for them as quickly as possible in the familiar surroundings. Such a combination of TGZ's and industrial or business parks guaranteeing this with adequate space is however only available in a few locations (e.g., Dortmund, Berlin, Nordhorn).
- The potential for truly technology-oriented start-ups (approx. 250-300 per year) is, according to current information, insufficient to utilize all the TGZ's appropriately especially for the long term. A real threat to the existence of more than a few TGZ's is the fact that the potential mentioned is quite unevenly distributed geographically, and thus the numerous TGZ's in peripheral regions in particular could very soon experience problems in finding the next generation of specialized employees because of unfavorable local conditions. TGZ's themselves are hardly capable of increasing this potential since they increase the likelihood of survival for existing technology-oriented start-ups more than they encourage founding of new ones. The result is that even a totally successful TGZ idea may not be a means to achieve regional political goals in the sense of a strategy to balance existing inter-regional disparities between agglomerated areas and peripheral areas. Agglomerated areas clearly have better chances for supporting successful TGZ's.

Local Conditions Must Be Suitable

On balance, the conclusion is that the instrument of the TGZ has without a doubt made a significant contribution in numerous cities and communities within the framework of an integrated strategy for promotion of trade and industry. However, the failure of existing TGZ's and some still to be opened seems equally certain for those whose promising goals do not correspond with local regional conditions. Lack of R&D infrastructures, a shortage of entrepreneurs, or inadequate personnel and/or financial resources for TGZ management threaten the existence of more than a few TGZ's in the intermediate to the long term.

Inter-Regional Competitiveness Assessed

36980091 Duesseldorf HANDELSBLATT in German23 Nov 88 p 28

[Article by Dr Hans Heuer, coordinator of the work area "Law, Economics, and Finances" of the German Institute for Urban Studies in Berlin: "Attention to Image and Marketing of Location Again Become Important Areas of Activity for the Communities"; first paragraph is HANDELSBLATT introduction]

[Text] Innovation-oriented promotion of trade and industry. A chance for local structural change.

The economy and society in the FRG are in the midst of a profound structural change which is linked in certain regions to significant negative secondary phenomena. New economic impulses on the local level are expected now primarily from measures promoting innovation. Thus, in recent years in numerous cities in the FRG territory, extremely diverse projects and initiatives with "novelty value" have appeared; their chances for success must be considered against the backdrop of national and international development.

In our economic order, not only companies, but also cities and communities are subject to the rules of competition. Hannover and Hamburg compete not only with Frankfurt and Stuttgart but with regions in other European countries and the world. In this, competitive conditions for the classical industrial localities of the Ruhr region have worsened considerably because, particularly, wage cost intensive production with simple technology is now finding its most favorable site in the developing countries of southeast Asia.

Cities With "Old" Structures on the Losing Side

Competition between cities has clearly increased in recent years. It will continue to increase, inevitably creating winners and losers time and again. Cities with "old" structures, i.e., old industrial structures, old ways of thinking, old labor and organizational forms, will find themselves on the losing side. The winners will be primarily those cities and regions which distinguish themselves through an "innovative local decisionmaking structure"—which adopt innovation more quickly than others.

We are on the threshold of significant economic and social upheaval based on the new information and communications technologies. The possibilities for rationalization of information technologies are currently only being utilized at the rate of about 20 percent. It is therefore obvious that the real challenges and upheavals still lie ahead of us. While we are continue to be spellbound with shipbuilding, coal, and steel, serious transformations are already emerging in a sector which currently remains the showpiece of German industry

and a technological front runner, i.e., in automobile construction, where significant job losses will have to be reckoned with in the next few years.

In the future, the chances for development in the region will be determined basically on the level of knowledge of the population. Already clear regional differences can be observed in the level of education and training of the population. A crucial problem for the future will be constant training. For this reason, the willingness and ability to constantly be trained and retrained will become key job qualifications. Therefore, one of the most important tasks of city policy is to assure a qualified workforce, i.e., to initiate or at least support measures for adult and post-graduate education.

It is not possible to get to the root of the problems of structural change with defensive strategies. This is the most important conclusion which we can draw from the analysis of the development of structurally weak regions of the FRG. One cannot avoid the problems which structural change brings. On the contrary, one must face this process head-on; one must accept structural change, encourage it, and understand that it is an opportunity. In this, cities should reflect on their own possibilities for development, i.e., on the so-called endogenous potential for development. And, here again, the support of small and middle-sized enterprises has special value, because, in the final analysis, it is only within them that increases in the number of jobs may be expected.

Innovation Potential Not Always Fully Utilized

The struggle against unemployment is not decided primarily in those places where jobs are lost but rather in those places where new structures and new fields of activity appear. Therefore an economic policy strategy which concentrates on the creation of new jobs is fundamentally correct. On the level of a municipal region, this can be achieved basically through supply-oriented economic policy, through planned development and land use, through simplification of the start-up process, through technology transfer and other measures which support innovation. It is a matter of mobilizing and using the existing potential for innovation. Various research results demonstrate that the local innovation potential present everywhere is for the most part inadequately utilized.

Intercommunity competition is increasing. This means that attention to image and marketing of location are again becoming significant areas of activity for community policy. A city that wants to remain competitive in the intercommunity rivalry must try to obtain an unmistakable profile. This is a matter of the distinguishability, of the individuality of a city. This not only increases its drawing power but also reinforces the inhabitants' identification with it.

The city of Frankfurt am Main is a good example of a city which long had an image as "a place with a miserable quality of life." With the restoration of the old opera house, the reconstruction of the Roemerberg, and the city's renovation of the Frankfurt museum and river area, the city has now acquired an new image as a cultural metropolis and a city of museums.

A Competitive Edge Hoped For Through Research Parks

Although this example can hardly be imitated in other cities, it is important to develop the specific opportunities a city has to offer in terms of a cultural specialty as its individual character.

Structural renewal on the local level must happen primarily from the inside out, and thus requires local effort. This is increasingly acknowledged and has led in recent years to numerous initiatives and projects which should give impetus to an acceleration of local structural change (see table).

The most familiar examples are the technology and start-up centers [TGZ's] of which there are now more than 60 in the FRG. In the meantime, the technology center movement has turned into a general "center movement." In addition to R&D centers, it is primarily user and service centers that are emerging now. In the cities, the hope is that these will offer the greatest possible enduring competitive edge over other regions. This hope can probably best be fulfilled in those areas where, in imitation of the American teleport idea, an infrastructure of a type increasingly demanded by modern businesses is provided, combining the greatest possible variety of telecommunications services with attractive municipal surroundings. A geographic concentration of telematics services in the form of a teleport is conceivable in many cities, without having to think on the scale of Frankfurt's Messeturm or Cologne's MediaPark.

The more developed the willingness to cooperate on the part of the local players, the greater the innovative capacity of a region. What is essential on the local level is a philosophy of "public-private partnerships," i.e., cooperation between the various groups of society. The beginnings of such new forms of cooperation and organization are already in place in the FRG. The most striking examples are the "Cologne Technology Roundtable" and the "Karlsruhe Technology Region."

Improved Services Objective of "Cologne Technology Roundtable"

The "Cologne Technology Roundtable" is a discussion forum from industry, universities, credit institutions and insurance companies, consulting firms, chambers and associations, labor unions, politicians, and public administration created in 1984 on the initiative of the mayor to formulate possible initiatives to strengthen the

efficiency of existing firms and to improve the attractiveness of the city of Cologne. Imitation of this model has now begun in other FRG cities.

The "Karlsruhe Technology Region" was created in the spring of 1987 on the initiative of Karlsruhe's mayor. In the legal form of a BGB company which finances its members with grants and allocations, the city of Karlsruhe cooperates with seven neighboring cities and two rural districts with the objective of joint presentation and marketing of the Karlsruhe economic region. Basic elements of this cooperation are the formulation of a unified corporate design, cultivation of a climate conducive to business and innovation, and joint promotion in the FRG and abroad.

"Regional Consciousness" Leads to a Dominant Position

In the long run, the advantage will be on the side of those regions that have succeeded in developing a regional consciousness, a "corporate identity," and in finding mechanisms to form a consensus that can lead to many varied types of local cooperation and have a stimulating effect on innovative human behavior.

A plan for the future of a municipal region can only be developed by the players of the place itself. This requires effort for consensus and cooperation. There are people with ideas everywhere. All that is needed is a social environment, an innovative and cooperative atmosphere, in which these ideas can be articulated, discussed, and tested. Where this is found, the chances for structural renewal are favorable.

Table: Examples of Local Initiatives for Promotion of Innovation and Technology

Type of Measure	Examples
Technology facilities	—Dortmund Technology Center —Cologne MediaPark —Nordhorn Telehaus
Information, technology, and personnel transfer	—Berlin Innovation and Technology Conference BIG-TECH —Berlin "Innovations Assistant" —Brochure "Environmental Technology in Dortmund"
Promotion of start-ups	—Business start-up, Cologne, e.V. —Lueneburg GTS (Start-up and Technology Service) —Pforzheim Start-up Program
New forms of financing	—Berlin Innovation Fund —Siegen Siegerland Fund —Marburg-Biedenkopf Regional Development Fund
Qualifications and continued training	—Society for New Professions, GNB Berlin —Educational Union of the Elbe-Weser Region —Hennef Association for Promotion of CNC Technology
New forms of cooperation	—Cologne Technology Roundtable —Neuss Technology Working Group —Karlsruhe Technology Region

Karlsruhe Leads Nation-Wide

36980091 Duesseldorf HANDELSBLATT in German23 Nov 88 pp 27-28

[Article by Helmut Boerkircher and Horst Zajonc: "Karlsruhe Technology Region: Efficient Use of Local Advantages; Industrial Locations/Dense Research Network Surrounds the 'Residence of the Law'"]

[Text] Promotion of trade and industry is successful if it is simple and genuine. Karlsruhe and its region know how to live by this rule which is more easily said than done. They have some basic local advantages; it is only a matter of using them efficiently.

The technological potential, claimed by each and everyone today, is real and abundantly present in Karlsruhe. Karlsruhe has a technical university, the oldest and one of the most renowned German schools of engineering. Its Informatics Department is the FRG's largest. Mechanical engineering, process technology, and materials sciences have a long tradition. Information technology is well established in Karlsruhe as a binding element of all modern natural and engineering science research. The HECTOR project (Hetrogenous [as published] Computers Together), which the university carried out with IBM, is clear proof of that. Further examples are the cooperation with other large players in this sector such as Siemens and DEC, the latter of which installed a research center near the campus in Karlsruhe. A similar list could be drawn up for the school of engineering and numerous other research institutions in Karlsruhe.

Fraunhofer Institute, land and national research establishments, and the Karlsruhe Nuclear Research Center have caused about 50 percent of the extra-university research potential of the high-tech land of Baden-Wuerttemberg to be concentrated in Karlsruhe.

On this fertile soil the technology factory of Karlsruhe has become the most successful German technological center with 30 firms and approximately 700 new jobs so far.

The geographic location, a German border area for decades, is now central to Europe and immediately adjacent to France. Karlsruhe therefore has a locational advantage which has for a long time not been adequately exploited. Large French companies like L'Oreal and Michelin already have their German headquarters in Karlsruhe. German firms like Siemens and Bruker Physik have plants in Alsace. This international cooperation is going to increase further. 1992 is certainly an important date in this respect. The effects of the growing together of the regions around Karlsruhe and Strasbourg into an international economic area will have to be measured on a long-term scale. Work on this is already in full swing. The TGV with its line from Paris to Munich via Nancy, Strasbourg, Karlsruhe, and Stuttgart is one of the large projects involved.

In terms of autobahn connections, Karlsruhe is in the industrial center of gravity of the FRG, equidistant from the Ruhr and Rhine-Main region and the agglomerated areas of Stuttgart and Munich. In 1989 Karlsruhe will have a four-lane autobahn toward the south.

Of course, Karlsruhe has many other local advantages. Cultural and leisure assets, an administration friendly to business, and a highly qualified workforce should be mentioned.

Karlsruhe's promotion of trade and industry does however have one problem, at least as things currently stand. There is inadequate industrial land, from the standpoint of site quality, a fact which has thus far made location of technology-oriented firms difficult. Help is currently on the way: First, through cooperation of the city with its region, institutionalized as the Karlsruhe Technology Region; and, second, through identification of valuable industrial land within the city of Karlsruhe itself for firms that need both proximity to the university and good transportation links. This is especially clear in the plans for a 20-hectare Karlsruhe Technology Park, which will become a new downtown area, 15 minutes on foot to the technical university and 15 minutes by car to all the Karlsruhe research institutions.

The New Local Profile of the Technology Region

Karlsruhe is the dominating center of the technology region of the same name. The Karlsruhe Technology Region GdbR is an instrument for marketing the local region. From this standpoint, it has an image-building effect and also serves as the starting location for firms wishing to relocate.

The Karlsruhe Technology Region is however also a forum for internal regional cooperation and a clearing house for the interests of business, science, and the communities. Members of the society are are the cities of Baden-Baden, Bretten, Bruchsal, Buehl, Ettlingen, Gaggenau, Karlsruhe, and Rastatt as well as the two rural districts of Karlsruhe and Rastatt. The Karlsruhe Chamber of Industry and Trade is responsible for management of the Technology Region.

Karlsruhe is widely known as the "Residence of the Law," and its image is that of a city of civil servants. In contrast, the economic and technical-scientific significance of the region has been insufficiently recognized. Through general advertising, purposeful public relations activities, and participation in foreign and domestic fairs, the scientific and technical factors of the location are to be introduced to the general consciousness by the society. In the future, the image of the Karlsruhe region will be linked with the idea that firms which produce high quality and technically demanding products are at work here. Also, firms will be supported in their marketing efforts, and the area will be presented attractively to firms which are ready to relocate. The new local profile of "Technology Region" is also intended to increase the ability to attract and keep qualified experts.

A corporate design will give the area a uniform appearance through signs, slogans, type-face, color, etc. As a trademark, this corporate design should contribute both to the identification of the research facilities with the Technology Region and to the identification of the firms and the communities with the image of the trademark. An information and communication system is currently being built for the important local factors such as research, development, and innovation potentials; cultural, leisure, recreational, and residential assets of the region; and also the availability of industrial land. This information and communication system is to be accessible at any time to potentially interested persons via modern telecommunications facilities. The management of the Technology Region will announce available business land and buildings and will advise firms in the search for cooperative partners in business and science. The most important working principle of the Karlsruhe Technology Region is to help both unconventional firms which are ready to relocate and firms already in the region to realize their potential. The entrepreneur will not find glossy brochures with lists of subsidies here. What we offer is rapid location of sites, possibilities for cooperation, and projects suitable for transfer from the science sector as well as qualified employees. Above and beyond that, we offer market proximity to qualified customers in the immediate vicinity in Baden-Wuerttemberg and in nearby France.

Poor Research Coordination Said To Weaken FRG Position in EC

36980094a Duesseldorf HANDELSBLATT in German30 Nov 88 p 15

[Article: "Research: Annual AGF Conference—Prof Hempel Calls for Joint Secretariat. Position of Germans in Brussels to be Strengthened through Better Coordination"]

[Text] Munich, 29 Nov (OSL)—The strength of FRG research lies in its variety, which becomes a weakness, however, when it comes to putting forth its demands

within Europe. This is the opinion of Dr Gotthilf Hempel, Chairman of the Working Group of the Large-Scale Research Facilities (AGF), who called for a research secretariat to establish joint priorities in the future and to bring about better representation in Europe.

At a press conference on the occasion of the annual AGF conference in Munich, Professor Hempel, who has just returned from an expedition aboard the research vessel "Polarstern," praised the variety of cooperative efforts between German research facilities and institutes, advanced schools and industrial partners within the FRG and abroad. The 13 facilities have around 20,000 employees, of whom 10,000 are scientists.

Total funding amounts to about DM 2.5 billion, 90 percent of which is contributed by the Federal Government and 10 percent of which is provided by the Laender in which the institutes operate. The working group includes four facilities with annual budgets of more than DM 300 million: The German Research and Experimental Institute for Aeronautics and Astronautics (DFVLR), the Juelich Nuclear Research Facility (KFA), the Karlsruhe Nuclear Research Center (K fK) and the German Electron Synchrotron (DESY). Another four institutes have budgets which lie between DM 100 and 150 million: the Society for Heavy-Ion Research (GSI), the Max Planck Institute for Plasma Physics (IPP), the Society for Radiation and Environmental Research (GSF) and the Society for Mathematics and Data Processing (GMD).

Prof Hempel criticized the inflexibility of the staffing schedules, and stated that "in order to deal with current problems such as the death of the forests and alternative sources of energy we need a new generation of facilities staffed by a new generation of scientists, because it is impossible to transfer a 50-year-old research scientist to a completely new discipline. But we lack the resources to bring such flexibility about."

Staffing Schedules Impede Necessary Flexibility

Hempel also sees weaknesses in the European orientation of German research, and believes that if a "unified scientific community" also results from the creation of a common European domestic market after 1992, more and more resources for research will be provided via the European Community. While the French and British institutes in Brussels have been quite effective in speaking "with one voice" concerning their research priorities, German research presents itself in all of its diversity.

Hempel calls for the founding of at least a joint secretariat for coordination and priority-setting by the Max Planck Society, the Fraunhofer Society and the German Research Association, for example, as well as the West German Conference of Chancellors of the advanced schools. Such a secretariat should not degenerate into a centralist apparatus, however, as that "would spell the end of German research, whose strength lies precisely in its variety, and thus its flexibility."

According to Hempel, the AGF should direct its attention above all toward increasingly important projects in the areas of the environment, general and medical welfare, alternative energy sources and materials research. He does not feel that a clear research policy, such as the one being supported for the FRG by the Ministry for Research and Technology (BMFT), yet applies to the whole of Europe, although there are a number of pan-European programs already under way such as the ESA, EURATOM, ESPRIT, BRITE and CERN.

He went on to indicate the definite advantages of this pluralism compared with the centralized and inflexible programs in the United States and Japan. In Japan, interest in basic research is growing because it has been realized that purely market-oriented development is not enough to compete in the technological arena in the long run.

Goals, Problems of French 1989 Research Budget Discussed

36980111c Stuttgart VDI NACHRICHTEN in German 2 Dec 88 p 2

[Article by Carsten Schroeder: "France Intensifies Support of Research and Technology: High-Flying Plans and Banal Problems: The Next Generation Is Scarcely Interested in a University Career"]

[Text] Paris, 2 Dec 88—Hubert Curien, the minister of Research & Technology since the victory of the French Socialists last summer, has high-flying plans. One of his star projects ended up in space last week: Jean-Loup Chretien will work together with Soviet cosmonauts for nearly one month on the Mir space station.

Curien is not lacking in self-confidence. France is the leading European nation in space travel, he said recently. And for this reason, it is orienting its projects towards the two superpowers.

The French were glad to accept the offer by the Soviets, who under the influence of glasnost are seeking international cooperation in space and constantly waving invitations to their space station, and they did so without ideological stomach-aches. And why should they have any?—Another French astronaut, Patrick Baudry, recently flew on board an American space shuttle.

In the daily LE MONDE, Curien published an article in which he argued on behalf of the need for man to go into space—and called for a stronger commitment by Europeans to space travel. He pointed out emphatically that the French are the number one supporters of the European Space Agency (ESA).

The French commitment to space is an essential component of their current intensified efforts to promote research and technology. The research budget adopted at

the end of November provides for an increase of nearly eight percent. Taking inflation into account, this comes to an effective increase of five percent.

In this way, the French government is attempting to achieve international status. Through this budget, spending on research has been increased to nearly three percent of the gross social product, a level already adopted by the FRG, the United States and Japan.

This is a turnaround in French research policy, since the research and development sector was subjected to criminal negligence over the last 2 years under conservative Prime Minister Jacques Chirac. Drastic cuts were made in the research budget, and for a time there was not even a minister of Research & Technology.

Curien wants to change this policy. On the one hand, he wants to retain the old French strategy of promoting technology primarily through large projects. At the same time, however, he has indicated that in the future he will emphasize cooperation between science and industry with greater intensity, and thus include smaller projects in his policy as well.

This is because he is dissatisfied with the involvement of French industry in research. Of the approximately 120 billion francs (around DM 36 billion) that the French spend each year in this sector, the state accounts for 60 percent. "Our goal is a 50-50 breakdown between private and state investors," Curien said before representatives of the international press, referring to the example of the FRG.

Despite enthusiasm surrounding the change in course, the French will presumably have problems converting the goals of their technology policy as a result of the inadequate next generation of scientists there. In approximately 3 to 5 years, the current generation of researchers must be replaced by younger people, since the majority of college instructors are nearing retirement age.

However, the incentives for the next generation of scientists are not especially good. Students who survive the selection process of the French educational system and are able to graduate from one of the elite schools are enticed by lucrative jobs in industry or at American colleges.

Nevertheless, Curien professes optimism: "I am not losing any sleep over that." On the contrary, he says that he is glad that talented Frenchmen are continuing their studies in the United States.

Many university rectors and college instructors have a very different outlook on this. Off the record, they moan, "How are we supposed to get good people for research if industry pays twice as much?"

Research Stressed in New French Budget

AN890061 Paris FRENCH TECHNOLOGY SURVEY in English Nov 88 pp 2-3

[Unattributed article: "Government's Priority in 1989: Research"]

[Text] In 1989, research will be one of the French Government's budget priorities. It is planned to increase the amount earmarked for research by 7.6 percent, that is, by almost $469 million. This increase is an about-face in comparison to the recent past, as credits actually decreased by 4 percent between 1986 and 1988. Four priorities have been defined for this budget. The first aims at an active policy of scientific employment, notably through the creation in 1989 of 918 new positions, that is, a 3-percent increase in the research staff employment rate. Some $7.8 million have also been allocated to increase the possibilities for foreign scientists to work in France. The second priority concerns development of training: The amounts allocated for this activity will be increased by 40 percent ($100 million as against $73 million). Research organisations (INRA-agricultural research, CNRS-scientific research, INSERM, etc.) will see their budgets increase by 6.4 percent under the third priority.

The fourth priority on the list covers increased assistance to industrial research. The allocations made to the Research and Technology Fund will increase by 30 percent to $1.220 billion as opposed to $145 million in 1988. This money will be used to finance the EUREKA program and industrial research in national programs in fields as varied as biotechnology, materials, foodstuffs, etc., and to launch major innovative projects that lead to the creation of new industrial products of high stategic and commercial importance (composite materials, supraconductors, recombining proteins, etc.). These amounts are further increased by the credits allocated by the ANVAR (French Agency for Research Applications), whose budget will also be increased by 24 percent. It aims at applying research and developing the industrial potential of small- and medium-sized firms. In all, the budget allocations devoted to research and innovation in companies will be up by 40 percent ($343 million as against $243 million). The emphasis being placed on industrial research can also be seen in technology development programs in which France holds a leading position worldwide. The allocations made for the space sector (French Space Research Center) have been increased by 20 percent. They will largely be used to fulfill France's international commitments made during the Haye Conference (Ariane V, Hermes, Columbus, etc.). Similarly, state backing for the electronics sector will be maintained through the allocation of $15 million that were not used in 1988.

Prospects For Italian High Tech Agency Discussed

MI890112 Milan ITALIA OGGI in Italian 18 Jan 88 p 20

[Text] As confirmed by data recently published by the EC Commission, Italy's research spending is far lower than other European countries such as the FRG, France, and the UK, although some progress has been made over the last 2 or 3 years. However it is not merely a matter of the amount of money spent, but rather how it is spent.

This is the opinion of Roberto Cassola, president of the Senate Industrial Committee, who advocates "innovations in the regulatory system and the infrastructure to support the country's scientific and technological development," that is, update Italian policy apparatus in the area of advanced technology.

This week, the socialist member of parliament will submit to the Committee a proposal divided into three "lines of reform:" the establishment of an agency for technological innovation, the establishment of a public body to advise both the parliament and the government, and a number of measures designed to support new entrepreneurs in the technological sector.

The agency should do more than the traditional allocation of funds. For example, it could also participate in the establishment of joint ventures with private partners, promote consortia to develop cooperation among the various authorities, or provide scientific services and infrastructure. According to Cassola, even state assistance should assume a different form: restrict the use of direct subsidies in favor of special forms of tax exemption and the merging of public and private capital.

Italy To Assume Presidency Of EUREKA Program In July

MI890104 Rome AIR PRESS in Italian 30 Dec 88 p 2422

[Text] (AIR PRESS)—In July 1989 (through June 1990) Italy will assume the presidency of the EC's EUREKA program, which has so far approved 210 projects with a total investment of over 6 trillion lire and the participation of more than 800 industrial firms. More than 80 Italian businesses and research institutes are involved in the program, with 62 projects and an overall investment of 900 billion lire. At a conference with representatives of these firms during which the guidelines underlying Italy's participation were described, Minister Ruberti pointed out that while Italy consistently refused to assume the presidency in the past, the position may provide a stimulus for further development of the research system in Italy and may enhance the level of integration between the national and the European systems. The minister requested that the companies involved take steps towards establishing a "preferential communication channel" to bring Italy's operational strategies up-to-date with procedural suggestions; he urged the businessmen to make proposals for matching government action with the growing need to internationalize research and to foster closer cooperation between academic research on the one hand, and world-wide scientific and technological growth on the other. He also requested that they assess the potential of the prospective extension of the EUREKA program to non-EC countries, indicating that this may prove to be a major element in the Italian mandate.

EC Commission Approves UK Plan on EUREKA Role

AN890085 Brussels EC PRESS RELEASE in English No IP(89) 40, 1 Feb 89 p 1

[Report entitled "The Commission Accepts an R&D Scheme Specific for EUREKA in the United Kingdom"]

[Text] The Commission has decided to approve the UK scheme for aid to EUREKA [European Research Coordinating Agency] projects.

This scheme has a budget of 13 million pounds Sterling (about 18.4 million ECU) for 1988-89 and is designed to promote the participation of UK firms in R&D projects with other European partners.

In reaching its decision, the Commission has taken into account the international and collaborative nature of EUREKA projects which can strengthen European technological capability in world markets, contribute to the completion of the single European market, and the fact that the maximum rate of intensity (40 percent) will normally be reduced after the definition phase to 27 percent in the second year and 20 percent in the third year of the research project.

Swede Appointed New EUREKA Secretary

36980093 Stockholm NY TEKNIK in Swedish 1 Dec 88 p 12

[Article by Miki Agerberg: "Brussels Next for New EUREKA Chief"]

[Excerpt] The next chief of the European technology cooperation, EUREKA, will be a Swede. This summer Olaf Meyer will move to Brussels in order to take over EUREKA's secretariat, a small and smooth-running organization outside the enormous EC machinery.

"I love to work with small organizations," he says.

When Olaf Meyer approached his 50th birthday, he began to rethink. At that time the German-born civil engineer had worked for Atlas Copco for many years, and he had also become adjunct professor of mining equipment technology. Would it be rock drilling machines for the rest of his life?

"I felt I was becoming more and more of an expert in a very narrow field," he says.

"I missed the breadth of my work and decided to do something about it when I turned 50."

He succeeded in that. Shortly after his 50th birthday he became the managing director of the Industrial Foundation, which makes decisions about hundreds of millions of kronor each year in venture capital to Swedish industrial development projects in all areas of technology.

And now, a few years later, he becomes head of EUREKA's secretariat, which coordinates technical development projects for all of western Europe. Broader than that it can hardly get.

In comparison with the giant EC machinery, EUREKA's secretariat with its seven officials resembles a dwarf. That does not worry Olaf Meyer.

"Quantity and quality need not be synonymous. At the Industrial Foundation we had only five officials, but we are doing an enormous amount of good in Sweden."

The very idea of EUREKA is precisely that it should not be governed from the top. Initiatives for new development projects should come from below, directly from the companies and the researchers. Each member country has its own coordinators, who pass on new projects for EUREKA cooperation.

The secretariat in Brussels is primarily a center for gathering and exchanging information and facilitating contacts. There is a data base, for example, open to all, with information about ongoing and planned EUREKA projects.

Rotation System

The structure differs entirely from EC's research program, in which certain goals are centrally established and funds set aside in order to reach them.

Both models are needed, in Olaf Meyer's opinion.

"Living industrial activity yields good ideas which lie outside the broad avenues of political priorities."

"Helping such projects is an expression of pluralism. If everything is mapped out, there is risk that it will be subject to the negative sides of national economic planning."

Thus, Olaf Meyer does not intend to do anything about the imbalance between various fields of technology in EUREKA, with many projects for robots and computers and few in environmental technology:

"No," he says. "The initiatives must come from outside."

"But," he later adds, "if very few proposals come from a certain field, it is necessary to find out why that is. Perhaps there is a lack of information."

Is EUREKA sufficiently well-known in Sweden?

"Probably not," Olaf Meyer says. "By disseminating knowledge one can awaken imagination and influence the opportunities which are available in international cooperation."

"But remember that the same thing holds true for international cooperation as for a marriage: If there is a strong, concrete reason for getting together, there is greater chance that it will last."

EUREKA's secretariat has a rotation system for involving all member nations in the work. It was therefore decided that the first head, Frenchman Xavier Fels, should be succeeded by either an Austrian or a Swede. The mandate period is 3 years.

"I think I can be useful with my experience," Olaf Meyer says. "And it is important for people in the Swedish industrial-political machinery to learn more about Europe."[Paragraph omitted]

Effects of EC Projects on European Competitiveness Assessed

36980086a Paris LE MONDE in French 3 Nov 88 p 32

[Article by Philippe Lemaitre: "Europe Still Has Opportunities in Race to Technological Development"]

[Text] Four years after the launching of ESPRIT [European Strategic Programs for Research and Development in Information Technology], and 3 years after the launching of EUREKA [European Research Coordination Agency], the situation of technological Europe is marked by "spectacular improvement." The mobilization effort that was undertaken has been a success, to the degree that the trend of technological decline of Western Europe—so much feared at the beginning of the 1980's—seems today to have been halted. However, this success remains partial, because "Europe's lag compared to the United States and Japan, though it may not be becoming more pronounced, does not appear to be making up lost ground."

The Americans and the Japanese have also expanded their effort; and other formidable competitors, such as South Korea, are arriving on front stage. Furthermore, the recovery is limited to the traditional technologies. Other "high tech" sectors deserve better attention if Europe does not want itself to again be outdistanced. This is true particularly of the biotechnologies and new materials. "Europe still has all its opportunities, but the objectives and means should be in part updated." These are the contrasting conclusions of a report just produced by experts of the Center for Analysis and Forecasting (CAP) of the Ministry of Foreign Affairs.

"In the two key sectors of computer technology and electronic components, the period 1984-1987 was astonishingly favorable for the European enterprises." In 3 years, the computer technology turnover of the six major European manufacturers (Siemens, Bull, Olivetti, Nixdorf, ICL, and Philips) doubled from $10 to $20 billion, while the turnover of the "small" American manufacturers was stagnating and that of IBM was increasing by 6 percent. Europe has four manufacturers among the top 15 in the world, compared to two in 1984. In regard to components, the report's authors underline the association of Thomson with the Italian SGS. Europe, they explain, has three powerful enterprises of this kind—STM (SGS-Thomson in microelectronics), and Siemens and Philips—which are investing more in proportion to their turnover than their American competitors.

This revived European industry is designing products that are fully competitive: "The mini-supercomputers of Parsys (U.K.) and Talmat (France) are three times faster than their American competitor." The report also refers to the points scored by the European manufacturers in high-definition television. However, it notes a little further on that "few of these new products have tackled the market."

Third Rank

Despite these encouraging results, the European information technologies industry remains third-rank, and is showing little boldness to open up unknown territory. "It is virtually absent from the markets whose growth promises to be explosive, such as gallium arsenide components or flat screens, though it has perfectly mastered the corresponding technologies. In other fields, such as fiber optics and optoelectronics, it has developed a lag, where not long ago it was ahead."

The Community programs, ESPRIT, BRITE [Basic Research in Industrial Technologies for Europe], RACE [Research and Development in Advanced Communications Technologies for Europe], as well as EUREKA, by urging companies or research institutes that had not been involved to cooperate, have contributed to decompartmentalization of Europe. This is far from completed. The initiative is still often too cautious. "The presence of national champions or big monopolies accounts for the European strategies being confined henceforth to the precompetitive and oriented toward the long term. Thus, the RACE program is preparing the telecommunciations of the next century, but in the meantime the Europeans will have developed seven different commutator types and will have faced, in spread-out formation, the threat of the Japanese in regard to the new terminals, and the threat of the Americans in the value-added networks or private communication satellites."

The lags in the integration process of European industry are distressing, because the United States and Japan are creating closer and closer ties, and are benefiting, more than they are suffering, from the technological development of the newly industrialized countries. The European research effort has grown and has been oriented toward industry. However, the same has been true in the United States and Japan, to the extent that our competitors retain their initial advantage. What is true on the quantitative level is also true on the methods level: the measures aimed at promoting cooperation among university laboratories and industries have multiplied in the Community, but the development of such a partnership is even more spectacular in the United States and Japan.

Reaction Capability

Despite these shortcomings, "Europe has given proof of its reaction capabilities," justifying in retrospect the voluntary approach adopted by the Community, and particularly by France, some years ago. However, this recovery approach must be maintained and broadened. The Community, defending the most urgent, has concentrated its efforts on the information and telecommunications technologies. The allocations to these sectors in the 1987-1991 framework plan reach 2.275 billion ECUs, compared to 220 million ECUs for advanced materials and 120 million ECUs for biotechnology. The same imbalances can be observed in the EUREKA accounts. Indeed, the situation in the promising sector of biotechnology is developing in a disturbing way. In the United States, "numerous small companies are launching into the market with a few products." In Japan, the large groups "maintain teams that publish a lot and register a large number of patents." In South Korea, "a veritable biotechnological strategy is underway." Europe, for its part, "does not give the impression of wanting to be the first to produce and sell the new products on a large scale." However, it does have significant cards to play, and, in particular, a powerful pharmaceutical industry with a developed research tool. However, the latter is showing a dubious attitude: "The new medical technologies do not correspond very well with the chemical savoir faire of the large pharmaceutical groups, and could threaten the existing incomes from the traditional therapies." The resulting wait-and-see policy is even more regrettable since the Japanese, relying on biotechnology, "are preparing a world breakthrough by their pharmaceutical industry."

"Strategic Deficiencies"

The authors of the report, deploring this characteristic example of the "strategic deficiencies" of the Community, suggest to the public authorities that they react. "Europe could convert into a trump card one of its most formidable handicaps: the growth of its social protection expenditures. Indeed, its social security insitutions offer it the largest solvent market in the world in this field. Becoming, thanks to this market, the major mass producer of new products would lead to commercial successes abroad."

The obstacles to the launching of a genetic engineering EUREKA, based on coordinated action by health administrations, are not lacking. The Americans, swift to denounce the subsidy policies applied by the Community, would doubtless view with jaundiced eye this policy of financing through social security the development of diagnostic tests or new vaccines. But is that reason to pass it up? Nothing prevents thinking together about means to develop in a harmonious way the demand for new health products, and the CAP experts believe that France could take an initiative in this direction. the United Kingdom, whose pharmaceutical industry is less reticent in regard to the biotechnologies than its German counterpart, should be chosen as the privileged partner to sponsor such an enterprise.

SUPERCONDUCTIVITY

FRG: New Production Process for Superconducting Thin Films

3698M091 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 17 Nov 88 p 9

[Excerpt] Scientists at the Institute of Coating and Ion Technology at the Jülich Nuclear Research Establishment GmbH have developed an extremely simple and rapid process for producing thin high-temperature superconducting films. This method uses a high-performance laser to erode and vacuum coat the high-temperature superconductor. [passage omitted] Its applications include using superconducting films to wire semiconductor components on a computer chip. Among other things this could reduce the heavy loss of heat exhausted by fans in personal computers. The components could also achieve higher computing speeds. A new generation of components might also be developed by introducing superconductivity into conventional semiconductor technology.

The manufacture of thin films from the new superconductors is a precondition for this application. In comparison with other methods used to produce high-grade superconductor films of similar quality, the advantages of the procedure developed at the Jülich Nuclear Research Establishment are simplicity and speed; a substrate can be installed, heated to a high temperature, coated, and extracted in less than 5 minutes. All the time-wasting secondary operations essential in other processes are superfluous here.

The resulting superconducting films have complete, precise junctions over 92 K. The films thus have the same properties as the original material.

In addition, the thin films have another important property, which is high current carrying capacity. Thus $SrTiO_3$ substrates can be coated with films that can carry over 1.5 million amps per cm^2 without loss at 77 K. This value is comparable with the best Japanese and American results. The films obtained in this manner are polycrystalline and their c-axial orientation tends to be perpendicular to the substrate surface on both monocrystalline $SrTiO_3$ and monocrystalline (random orientation) ZrO_2. Unlike other methods, the laser cutting process results in films of only 10 nm thickness with excellent superconducting properties.

The universality of this process gives grounds for assuming that it might also be successfully applied to other refractory alloys. Several FRG companies have already expressed great interest in the results achieved by the Jülich Nuclear Research Establishment.

Dutch Superconductivity Research Program Gets Government Assistance

AN890069 Zoetermeer SCIENCE POLICY IN THE NETHERLANDS in English Dec 88 p 16

[Article entitled: "Two Million Guilders for National Superconductivity Research Programme"]

[Excerpts] The Netherlands Minister for Education and Science, Mr W.J. Deetman, has got the National Superconductivity Research Program off to a flying start with a subsidy of 2 million guilders. The Minister made the announcement in a letter to the High Tc Superconductivity Steering Group.

"I greatly value the initiative which you have taken in setting up this program," the Minister writes. "It gives the Netherlands the opportunity to keep up with international developments in the field of ceramic superconductors." Mr Deetman and the Minister for Economic Affairs, Dr R. de Korte, had been approached by the Steering Group with a National Superconductivity Program. It was this suggestion that prompted the Minister to allocate the 2 million guilders.

Nine Dutch research institutes in the public and private sectors are involved in high-temperature superconductivity. They are the Foundation for Fundamental Research on Matter (FOM) and the Netherlands Organisation for Chemical Research (SON), both of which come under the Netherlands Organisation for Scientific Research (NWO), the Netherlands Organisation for Applied Scientific Research (TNO), the Netherlands Energy Research Centre (ECN), the research divisions of Philips, Akzo, Shell and the Electrical Goods Standards Institution (KEMA), and the energy research consultants Energy Research Project Management Bureau (PEO). These organisations have come together to form the Steering Group, whose secretariat is provided by the FOM.

Good Reputation

[passage omitted] The Netherlands has always had a good reputation in research into superconductivity. In this letter, the Minister pointed out that it should be up to research institutes and umbrella organisations themselves to react to new scientific developments. This was

a special case, however: a quantum leap which would very soon have a major impact on science, technology and society. The Minister said that he understood the Steering Group's reasons for requesting government assistance because it had not been possible to budget in time for the large investment involved. A subsidy for 1988 of 1 million guilders will be funded from the Science Policy Promotion Fund. A further one million guilders for 1989 will be made available from funds for university and para-university institutions.

The Minister has attached certain conditions to this additional funding: a solid research infrastructure will have to be developed and priority must be given to close international cooperation. Moreover, the Steering Group is requested to submit a twice-yearly scientific and financial report. The first report is due on 1 March 1989. Finally, the Steering Group will be given official status.

TECHNOLOGY TRANSFER

USSR Scientists Install Magnet for Hera Particle Accelerator

51002420 Stuttgart VDI NACHRICHTEN in German 2 Dec 88 p 37

[Article by Gero von Randow: "Desy Imports Soviet Ideas—Leningrad Shipyard Produced a 426-ton Magnet"]

[Text] Hamburg—For years now FRG and Soviet scientists have been working together on a spectacular large-scale project that has been largely unnoticed by the political public: The new storage ring Hera [Hadron-Electron Ring Accelerator Facility] at the German Electron Synchrotron (Desy) in Hamburg—a model for cooperation between the East and West.

Electrons are elementary, science assumes; but protons, which alone or together with neutrons form the atomic nuclei, are composite. Their building blocks are called "quarks"—and there are speculations that even quarks have a structure. In order to investigate the world of the smallest particles, decades ago science turned to a large-scale technology: The accelerators. In facilities of cyclopean dimensions, electrons, positrons, neutrons, and other particles are moved up into high-energy states; then they circle at almost the speed of light within so-called storage rings.

The designers of these facilities are using and developing the most advanced technologies. The racing particle packets must not collide with molecules that have strayed into their path: A challenge for high-vacuum engineering. The magnets guiding the particle beam must generate a strength of several teslas within storage rings of the new generation: Unthinkable without superconducting windings. Such storage rings are high-technology aggregates that can be brought into the world only if several nations participate in their construction by means of top-quality breakthroughs. Such a facility is being built to the west of Hamburg and about 20 m below the surface of the earth. At the Desy large-scale research institute the accelerator Hera is being built. Hera will consist of two rings each with a circumference of 6.4 km, in which electrons and protons in packets of 100 billion each will move in opposite directions and with a speed of 50,0100 revolutions per second. The electrons attain an energy of 30 giga-electron volts (GeV), while the protons reach as much as 820 GeV. As a comparison: A few GeV are reached in a television tube. These projectiles are aimed at one another within four chambers; what happens in head-on collisions should convey new knowledge about the finest structures of matter beyond our present-day understanding. Hera should permit the detection of structures down to a size of 10_{-18} cm.

"We are forming a sort of spearhead for international cooperation," confidently says Paul Soeding, a member of the Desy board of directors. This physicist heads the setup of the experiments at the Hera project. At present two detection apparatuses are being built, Zeus and H1, and scientists and engineers from over 80 institutes in 18 different countries are taking part in these projects. The detectors are housed in subterranean halls. In the H1 hall Soviet technicians and engineers are just now setting up the final components of an iron magnet 426 tons in weight. A Leningrad shipyard provided the thick sections. The iron yoke, as high as a house, has a fine inner structure and had to be manufactured far more precisely than, for instance, a ship's hull. The closeness to tolerance of the Soviet product has exceeded all expectations, it being said in Hamburg.

"With this tremendous drumroll a group from Moscow's Lebedev Institute has joined us," states Prof Soeding. "It is being led by the renowned Professor P. A. Cherenkov—the man who discovered the light effect named after him. I knew him only from textbooks, and then one day he turned up here unexpectedly and asked if he could assist in Hera." The Soviet Nobel Prize winner, 82 years old, still heads his group, which is making important contributions to the H1 experiment. A second Soviet institute is also taking part in H1: The world-famous Institute for Theoretical and Experimental Physics (ITEP) in Moscow. Moreover there has been cooperation for years with high-energy physicists from Yerevan and with colleagues from the Siberian scientists' village Akademgorok—that enclave of ideas from which Gorbachev has assembled his staff of advisors.

The Hamburg scientists think highly of the originality of Soviet ideas. The Soviets are regarded as brilliant theoreticians. On the other hand, their problems are said to lie in the area of instruments. Certainly this is one reason why they should interest themselves in Desy, which is one of a handful of institutes in the world where such large-scale and expensive engineering is available to science.

Facilities of this order of magnitude require not only scientific but also financial cooperation. The contributions of the participants are provided not mainly in money, but in components. In this area even the CEMA (Council for Economic Mutual Assistance) countries, which are poor in foreign exchange, can hold their own. This iron structure for the H1 detector with a value of DM 8 million—calculated on the basis of our own pricing framework—is the Soviet contribution to the financing of Hera. However, the foreign-exchange problem makes itself felt when it is a question of Soviet scientists staying in the West. But with good will and a little ingenuity some things can be done; for years now an average of 10 Soviet scientists have been working at Desy.

In the past, political travel restrictions have hindered cooperation; however, Soviet Perestroika is leading to improvements here as well.

On the Western side there are restrictions as well. Desy must keep strictly to the Cocom [Coordinating Committee for East-West Trade Policy] list. "This is a nuisance, and it hinders our work," complains Prof Soeding. Technology transfer is simply a part of scientific exchange. For example, at the Soviet synchrotron UNK in Serpukhov, magnets with superconducting windings are being used that were developed at Desy. Here there were no Cocom problems; nevertheless it sometimes takes days to simply determine which circuits are allowed to be sent from this country to the East and which are not.

Paul Soeding is hoping for improved relations between Bonn and Moscow. Then perhaps the mutual reservations against an on-line interlinking of the computer and information systems in the German and Soviet institutes will also disappear. "We want these hookups, because there is also a danger of centralization: The key people will come here and their home institutes will empty out—that trend must be countered. This can be done only with computer hookups."

The construction work for the Hera tunnel and experimentation halls have been completed, and the electron ring is already in working order. The first two detectors are under construction. The experiments should begin in 1990.

TELECOMMUNICATIONS R&D

French R&D on Digital Processing of Video Signals

AN890064 Paris FRENCH TECHNOLOGY SURVEY in English Nov 88 pp 6-7

[Unattributed article: "Digital Video Signal Restitution"]

[Text] The French Telecommunications Research Centre (CNET) and the Joint Centre for Telecommunications and Television Transmission Research (CCETT) have pooled their resources to develop a digital processing circuit for video signals. The technique consists in oversampling the signals so as to delete the need for analog post-filtering on the output from the DAC (Digital/Analog Converter).

Research into video processing circuits has a threefold aim:

- Simplify filtering and dematrixing functions through digital technology;
- Eventually reduce filtering, dematrixing and DAC functions to a single circuit;
- Make the use of analog video filters easier.

The processing of video signals in digital form has several applications, among which are the following:

- Transmission of still images at 64 kbit/s;
- Processing video signals for direct television transmission by satellite (D2-MAC);
- Improved image quality in terminals (image memory, 100-Hz screening, etc.).

ADVANCED MATERIALS

Czechoslovak Approaches to Development of New Materials Surveyed

24020014 Brno STROJIRENSKA VYROBY in Czech No 11, 1988 pp 824-830

[Article by Eng Jiri Brabnik, State Commission for Scientific-Technical and Investment Development: "New Metallic and Nonmetallic Materials"]

[Text] The use of so-called traditional materials (steel, nonferrous metals, stone, wood, concrete, etc.) has many disadvantages in light of the energy and labor intensity of these materials, including the following particular disadvantages:

- high energy-intensive production of the materials themselves (mainly with reference to metallic materials);
- great production waste, which occurs even despite optimal designs and production technologies;
- in some cases, traditional materials are no longer capable of meeting the requirements levied upon the final product (for example, low mass accompanied by high strength, resistance to corrosion, resistance to vibration, etc.) and, thus, become limiting factors with respect to further technical progress.

The energy-intensive nature of the national economy is very closely connected with the production of raw materials and materials and with the methods for their utilization. As early as the beginning of the 1960's, therefore, a new scientific discipline began to develop in the world—materials engineering—and currently, developed industrial nations devote significant financial means to research, development, and the introduction of production of so-called new materials.

This concept does not have a unified meaning thus far and, as a rule, the term is assigned to the following:

- new types of metallic materials having substantially higher and new physical, mechanical, technological, and utilizational characteristics;
- nontraditional nonmetallic materials with completely new qualitative characteristics and use possibilities.

New materials are always characterized by higher utilizational characteristics (that is to say, they better meet the requirements levied upon the material in question) and their use makes possible the attainment of better parameters for products, for example, lower mass, greater load, longer service life, and greater reliability, lower demands for maintenance, etc. The extraordinary efficiency of these materials lies not only in the relatively low energy requirements for their production from unexhausted raw material resources, but also in the possibility of being able to process them with new low-waste and waste-free technologies. Moreover, it is possible to produce most of the new materials with such characteristics as will be required of them in actual use in specific products (materials are so-called "made to measure").

In future, this will mean turning away from the mass production of several types of existing materials with universal characteristics and it will be necessary to make a transition to the production of a broad assortment of new materials in relatively small volumes, in accordance with the specific requirements for their use. As a result of this development, the rebuilding of the materials base will ensue and fundamental changes will occur in supplier-consumer relationships, since users of materials will closely collaborate with their producers and will exert pressure, through their requirements, upon the development of new materials systems.

In conjunction with the world trend, Czechoslovakia is also devoting the necessary attention to new materials in long-term conceptions involving the development of the Czechoslovak national economy with the goal of assuring the requirements of the processing industry through a materials base requiring a substantially lower energy input and having a higher specific effectivity in comparison with the existing status. The necessity of this approach is also emphasized by the gradual exhaustion of nonrenewable energy sources and supplies of strategic raw materials, by the high ecological cost involving the production of traditional metallic materials, and by the constantly growing expenditures required to assure the supply of raw materials and energy.

With a view to the specific structure of the Czechoslovak national economy, therefore, the State Commission for Scientific-Technical and Investment Development (SK VTRI) has worked out a proposed program of development for new materials and technologies for their production and processing. This program is aimed primarily at those materials which will facilitate the materials and energy intensity of creating national income and which will, simultaneously, contribute to the introduction of higher-grade innovations in key industrial branches—in other words, primarily in the engineering industry and in the electrotechnical industry. At the same time, the program is designed to help lower the existing extremely high production and consumption of ferrous metals and should have a resulting positive ecological effect. An important criterion for including individual materials groups in the proposed program was also the possibility of producing materials primarily from domestic raw materials.

The above requirements are intended to be fulfilled by realizations in three basic directions of scientific-technical development in the area of materials and technology:

- innovation and development of new types of materials in traditional materials areas—that is to say, steel, nonferrous metals and their alloys, etc.;

- research, development, and production of nontraditional new types of materials;
- research, development, and introduction of new production and processing technologies for both previous groups of materials, making possible the reduction of the materials and energy intensity of production.

These three principal directions were worked up in the proposal for the program into seven individual subprograms as follows:

1. Increasing the utility characteristics of metallic materials
2. Powder metallurgy
3. Semiconductor materials and pure metals
4. Composite materials
5. Progressive ceramic materials
6. Superconductive materials
7. Industrial carbon

The sequence of the individual subprograms cannot be considered to be the sequence of their significance, because each of them will make its own specific contributions to the Czechoslovak national economy.

Increasing the Utility Characteristics of Metallic Materials

The goal of this program is the innovation of conventional metallic materials, together with increasing their utility characteristics. It is divided into three problem areas:

a) Steels

In this area, the subprogram is oriented toward the development of special steels for desulfurization devices, high tensile strength structural steels with a high yield point for use in temperatures up to -60 degrees C; steels for cryogenic temperatures (for example, for reservoirs for liquefied gases) and corrosion-resistant steels for the chemical and food industries and for biotechnology (materials for processing urea, fermentation vats, etc.).

This area also includes amorphous and microcrystalline materials in the form of tapes, which are primarily suited for use in the electrotechnical industry and in instrument technology.

b) Nonferrous Metals

In the area of nonferrous metals, the accent is primarily on the development of new alloys on the basis of aluminum, having high physical-mechanical parameters for use in aviation technology and in the transportation engineering industry, and on innovative materials based on copper for the electrotechnical industry. Part of the solution also involves new production technologies for accurate and high-quality semifinished products made of these materials (forgings, sheets, slabs, strips), including the utilization of automation for technological operations.

c) Surface Treatment

In the area of surface treatment, the goal is to increase the utility characteristics of engineering and electrotechnical products through the introduction of various types of secondary beneficiation for metallic materials. This involves various methods of physical (PVD) and chemical (CVD) processing of surfaces—for example, thermal processing, surface alloying with lasers, application of metallic and nonmetallic coatings with plasma technology, ion implantation, and other technologies for the creation of protective and functional surface layers.

Powder Metallurgy

The development of powder metallurgy and the production of components from metallic powders makes it possible to achieve an express lowering of materials and energy costs in comparison with traditional fabrication processes (about 90-95 percent of the material is used, energy savings amount to 30-50 percent, and labor intensity is reduced by 30-70 percent) particularly thanks to the utilization of waste-free production technologies and closed production cycles. Production processes utilizing powder metallurgy make possible the broad establishment of automated and robotized work stations and, thus, also contribute to the elimination of strenuous physical work and toward improving working conditions.

Currently, powder metallurgy makes possible the production of materials having qualitatively higher parameters (for example, higher tensile strength, longer service life, corrosion resistance, lower mass) as well as the production of totally new types of materials having high utility characteristics which cannot be produced by any other technologies at all (high-efficiency magnetic and semiconductor materials, superhard materials, etc.). This is positively reflected in the improved quality of products in which powder metallurgy components are used—primarily thanks to longer service life and lowered maintenance requirements.

The powder metallurgy (PM) subprogram is broken down into three problem areas:

a) PM for alloyed steels and other alloys
b) PM for iron and steel
c) PM for special materials and nonferrous metals

A) In the area of alloyed steels, the goal is to develop production technology for high-speed tool steels and tools made from them. It is anticipated that the service life of cutting tools made from RO powder will be extended by 100 percent and that productivity in using these tools for machining will rise at least 30 percent.

Production of RO powder will be based on the atomization of the liquid alloy through an inert gas; production of semifinished products and tools will utilize the technology of hot isostatic pressing (HIP), and will use a combination of rolling and forging and additional processes.

B) In the area of the powder metallurgy of iron and steel, the solution of developmental and research work will be aimed at the automation of production operations involved in the processing of metal powders into final components. It is anticipated that new PM production technologies will be developed (extrusion and rolling of powders, injection molding, HIP, etc.) and that the automation of production of metallic powders and steels will expand and that production technologies for extremely pure and highly alloyed powders will be developed.

C) In the area of powder metallurgy for special materials and nonferrous metals, an orientation toward three decisive areas is anticipated:

- development of composite and coated tool materials on the basis of sintered carbides and superhard materials and the automation of their production;
- development of new types of magnetic and semiconductor materials for the electrotechnical industry (hard magnetic materials on the basis of Nd-Fe-B, semiconductor sensors for nonelectric variables, etc.);
- development of amorphous and microcrystalline materials on the basis of nonferrous metals.

Semiconductor Materials and Pure Metals

The components base, in which the most important role is played by active semiconductor components, is of decisive significance to the development of electronics and microelectronics and for the electronification of the national economy. This base is supported by a broad spectrum of materials—particularly semiconductors and highly pure metals.

The most important semiconductor materials include silicon which, in the form of polished silicon plates, serves as the basic material for the production of semiconductor components. The annual production of silicon plates, expressed in terms of the per capita amount of plate area, is around 15 to 35 cm^2 in the most developed nations; in Czechoslovakia it is only 2.6 cm^2 per capita.

Production of two-part semiconductors on the basis of, for example, GaAs is also a prospect for Czechoslovakia, since domestic production of Ga represents 10 to 15 percent of world production. Polished substrate plates of monocrystalline GaAs can be universally applied, particularly in optical electronics (luminescent and infrared diodes, semiconductor laser diodes, photovoltaic cells, etc.). These are all new applications which will not even supplant the microelectronic applications of silicon in the long term.

Pure metals are used in electronics in the fabrication of monocrystals, in the synthesis of intermetallic compounds such as doping agents in microelectronic technologies, in applying thin layers of coating, and in the production of electrochemical sources. From the standpoint of requirements, the group of pure metals is characterized by a broad assortment and high qualitative parameters, required in small quantities.

The goal of the proposed subprogram is to support research, development, and production of the listed materials, achieving optimal utilization of domestic raw materials resources, and is divided into three basic areas:

a) Semiconductor Silicon

It is anticipated that solutions will be found for the entire technological cycle of semiconductor silicon production, including the creation of the appropriate capacities for the following:

- silicon tetrachloride ($SiCl_4$)
- trichlorosilicate (TCS)
- polycrystalline silicon
- monocrystallic silicon having a diameter of 100 to 200 mm
- polished silicon plates

b) Gallium Arsenide (GaAs)

In conjunction with the anticipated growth in the consumption of gallium arsenide for the solar program (production of photovoltaic cells), the development of technology for the production of gallium arsenide monocrystals with a diameter of up to 100 mm and the fabrication of substrate plates from these crystals is proposed.

c) Pure Metals and Alloys Having Special Physical Characteristics

A specific production program will be set up in accordance with the requirements and needs of the Czechoslovak electrotechnical industry; it is anticipated that the following pure metals, having a minimum purity of 4N5 and their alloys will need to be produced: Al, Sb, Sn, Pb, In, Cu, Cr, Cd, Bi (these will be quantities ranging from kilograms to maximums of 1 ton).

Composite Materials

This group of materials represents a breakthrough in existing methods of manufacture and utilization of materials. These are materials composed of various physically and chemically different and frequently incompatible components. In a continuous matrix, the

component aggregate or fiber reinforcement materials are dispersed and the entire system is then augmented with the addition of binding agents to thoroughly bind the individual components and the various additives used to assure the required special characteristics. The composition of the individual components is selected in such a manner as to facilitate the achievements of qualitatively new characteristics with respect to the composite—characteristics which cannot be achieved with any component separately and which are not even the sum total of the component characteristics.

Matrices for composites can be made of metal, ceramic materials, and, particularly, of organic origin—polymeric. Component aggregates are both inorganic and ceramic (they include $CaCo_3$, $Mg(OH)_2$, SiC, Al_2O_3), as well as organic (for example, wood flour). Fiber-stiffening materials are usually glass fibers, basalt fibers, carbon fibers, boron fibers, and various metallic fibers, both short and long fibers.

With respect to composite materials, their variety is specific. In harmony with the requirements for a final product, it is possible to develop materials having precisely outlined characteristics which will be thoroughly utilized in the final product. However, this depends on the availability of a wide assortment of individual components and on the thorough knowledge of the influence exerted by the arrangement, composition, structure, technology of preparation, and production of the material in question and its final characteristics.

A dominant position among composite materials is held by composites from organic matrices of a macromolecular character—polymer composites. The reason for their significant expansion is the stormy development of macromolecular chemistry and the plastics industry, making it possible to fulfill the basic requirements levied upon composites—namely, a high degree of variety and relatively easy fabrication.

Polymer matrices were hitherto produced virtually exclusively from petroleum, but starting materials can also be obtained from renewable raw materials (so-called phytomasses); the assurance of their availability is not tied to petrochemical sources.

Polymer composites are predominantly light structural materials and their use can lead to express materials and energy savings, both as a result of lower energy input in their production and as a result of lower production costs and a low quantity of production waste in their processing. This is given also by the very technology of processing composite materials; whereas the production of objects from traditional materials is based on removing material from a bigger semifinished product, in the production of composites, materials are combined or formed to achieve the required dimension.

Polymer composites are already being produced throughout the world in a wide assortment, at varying prices, and with varying characteristics, ranging from massive composites which replace current metallic materials through engineering industry and key composites with totally new characteristics which are unattainable with traditional materials.

The main opportunities for utilizing polymer composites lie primarily in the construction industry (large-dimension facing for building facades, window frames, roofing for large areas), in the automobile industry (chassis components, crankshafts, springs, engine parts), in the aviation industry (airframes, propellers, tail surfaces, etc.).

To illustrate the efficiency of utilizing composites, it is possible to state that, for example, while the energy equivalent for the production of 100 km of alloy tubing with a diameter of 10 cm is 1,970 tons of petroleum, the same amount of tubing made from PVC accounts for only 275 tons of petroleum; added to the primary savings in energy are additional savings in utilization (lower costs for transportation thanks to lower weight, lower costs for maintenance, etc.). Similarly, operating costs for aircraft can be lowered by millions of korunas per year per aircraft by reducing aircraft weight through the use of composite materials to replace traditional materials.

The proposed subprogram anticipates the elimination of delays which Czechoslovakia suffers in the area of composite materials in comparison with developed industrial nations and is oriented at several basic groups of materials:

a) Polymer composites with component fillers (limestone, talc, magnesium hydroxide) and fiber reinforcement (primarily fiberglass) and polyolefin (polyethylene, polypropylene) and polyamide matrices; for mass utilization.

b) Key composites on the basis of carbon fibers (primarily the so-called C-E composites with epoxy matrices) for aviation equipment and for use in other industrial branches (textiles, engineering, robotics, health equipment, production of sporting goods).

c) Massive polymer composites for use in the automobile industry.

d) Metal composites having a high specific tensile strength and a modular elasticity on the basis of aluminum and titanium alloys, reinforced with carbon, boron, and steel fibers. Fire-resistant andrefractory composites on the basis of nickel. Utilization of the above materials will make possible the solution of the problem of extremely stressed structural elements while permitting the reduction of their weights of up to 30 percent and will result in the express lowering of the energy-intensive nature of their production.

e) Composite materials with ceramic matrices for use under conditions of extreme temperature, mechanical and chemical stressing.

Progressive Ceramic Materials

One of the ways to lower the dependency of the national economy on strategic metals and nonrenewable energy sources is the gradual introduction of new ceramic materials. A massive transition to the use of these materials results expressly, for example, in energy savings. According to Japanese sources, ceramics production, when compared to the production of steel, makes possible a reduction in energy requirements by 50 percent and, in comparison with the production of aluminum, even of 80 percent. New structural ceramic components, for example, when used in combustion engines, reduce fuel consumption by as much as 20 percent.

Generally, new ceramic materials are considered as one of the most promising directions of scientific development, together with composite materials through the end of this century and their mass application should show up particularly following the year 2000. We can break down the new ceramic materials as follows:

- oxide ceramics (on the basis of metal oxides such as, for example, aluminum oxide, zirconium oxide, etc.);
- nonoxide ceramics (on the basis of nitrides, carbides, etc., such as silicon nitride, boron nitride, silicon carbide, etc.)

The starting materials prior to processing into specific shapes and product dimensions are chemically homogeneous powders having a precisely defined shape and dimension of their individual components.

Ceramic materials are characterized by a high degree of hardness, by resistance to mechanical and chemical wear, are particularly suitable for use under conditions of high temperature (up to 1,400 degrees C, and possibly even up to 2,200 degrees C), they have outstanding magnetic characteristics, optical and electrical characteristics. This predestines ceramics for the most varied applications as follows:

- in the engineering industry (cutting and machining tools, dies, gauges);
- in the automobile industry (thermally stressed engine parts such as turbochargers, pistons, cylinders, insulation for intake and exhaust channels, abrasively stressed components such as valve lifters and valve guides, gaskets for water pumps);
- in the construction industry (ceramic sprays for structural components to increase their corrosion and abrasion resistance);
- in the electrotechnical industry (active and passive ceramic materials for integrated circuits, production of facilities to store electric energy, utilization of nontraditional sources of energy);
- in medicine (bone endoprostheses and tooth implants);
- in metallurgy (new refractory materials).

A disadvantage of the ceramic products is their brittle nature and their low resistance against impact; however, it is anticipated that it will be possible to eliminate this disadvantage by using ceramics in composite materials. Thus far, it has also not been possible to assure a high degree of reproducibility for all positive characteristics of materials involved in individual products, something which has thus far been caused by imperfect production technologies with which the existing high production costs are also connected.

For the present, ceramic materials are used primarily in the form of surface layers on metallic substrates to a small extent and in the form of compact components. Extensive use of compact ceramic components is anticipated with respect to combustion engines. Japan has already achieved encouraging results in this direction—it is expected that the efficiency of combustion in so-called "ceramic" engines will be as high as 50 percent.

The proposed subprogram places emphasis on the development of oxide ceramics, for which domestic raw materials resources are available. In view of the possibilities for utilizing new ceramic materials, the subprogram is divided into three basic components as follows:

a) Structural Ceramic Materials

The solution of this problem is supposed to primarily assure the development of oxide ceramics on the basis of domestic Al_2O_3 and ZrO_2 and some types of nonoxide ceramic materials (on the basis of nitrides and carbides) for use in the engineering industry with the goal of reducing the consumption of metals, fuels, energy, and of contributing to the intensification of production-technological processes.

b) Ceramic Materials for the Electrotechnical Industry and for Electronics

The goal here is to develop key materials which would make it possible to develop computer technology and to increase the competitiveness of Czechoslovak electrotechnical and engineering products in foreign markets. This is primarily a matter of the following:

- ceramic modular elements of electronic circuits and electrotechnical installations;
- laminated ceramic structures;
- progressive ceramic elements for VN and VVN installations.

c) Ceramic Materials Which Increase the Utility Characteristics of Products Made From Traditional Materials

The goal is oriented toward research and development in materials for various types of surface treatments of traditional materials which would increase their utility characteristics (corrosion resistance, resistance against abrasive damage and high temperatures, overall service life, etc.).

Superconductive Materials

The discovery of so-called high-temperature superconductive materials which show evidence of superconductivity even above the temperature of liquid nitrogen (77 degrees K) means a revolutionary turnabout in the possibilities for utilizing superconductivity. Such possibilities have hitherto been limited by temperatures of approximately 20 degrees K, which could be achieved only as a result of extreme expenditures for cooling apparatus with liquid helium. Current discoveries indicate that in the not too distant future materials will be available which have characteristics of superconductivity even at existing room temperatures.

The conducting of an electric current without electric resistance at ambient temperatures will signify revolutionary opportunities in savings of electric energy as well as completely new technical applications for superconductive materials in instrumentation and computer technology, as well as in the construction of energy facilities and transmission pathways.

Throughout the world and in Czechoslovakia, solutions for this problem are still at their very beginnings, but it is obvious that heightened attention must be devoted to this problem even now. The proposed subprogram, therefore, anticipates the identification of scientific research capacities and financial means with the goal of supporting research, development, and production of new high-temperature superconductive materials for use, at first, in electronics, computer technology (super-high-speed computers), and in medicine (tomography) and, subsequently, even in the heavy-current electrotechnical industry. A component of the solution will be development of production technologies and processing technologies for new superconductive materials.

Industrial Carbon

The processing of carbonaceous raw materials—petroleum tars, bituminous pitch, natural graphite, and others—various types of materials with very different characteristics can be produced depending on the starting raw material and the way it is processed, depending on the actual technology of processing and on other conditions. With respect to these materials, it is frequently possible to achieve unique combinations of physical, chemical, and mechanical parameters which then act as the bases for the broad utilization of products made of industrial carbon. What is involved here is primarily a high degree of thermal resistance and chemical stability, good electrical conductivity, high stability in a corrosive environment, resistance to abradability connected with good tribologic characteristics, and other special characteristics.

The expansion of processing branches for industrial carbon has a good outlook in Czechoslovakia because it offers the chance to utilize high-quality domestic raw materials—bituminous pitches and natural graphite. At the same time, it will make possible the elimination of financially very costly imports of carbon materials from nonsocialist countries. For these reasons, the proposal for the subprogram was worked out with an emphasis on the following materials:

a) Carbonaceous Materials and Products on the Basis of Domestic Bituminous Pitch

This is primarily a matter of mastering the technology of producing anode and needlelike coke by the so-called delay method for coking bituminous pitch. These semi-finished products are to lead to the introduction of additional graphited materials (for example, graphited electrodes for electric-arc furnaces).

b) Graphited Materials for the Electrotechnical Industry and for Electronics

The development of new carbonaceous material for use in heavy-current electrotechnology, for example, graphite saturated with metal and the innovation of existing materials for skimmers, collectors, and brushes of electric motors, and graphite for the production of superhard materials, etc., is anticipated.

c) Graphite and Graphite-Aluminum Materials for Metallurgy

The goal here is primarily to increase the quality of existing metallurgical materials (graphite crucibles, stoppers, and runner-spout and spout stopping materials) and the development of new refractory materials having a high content of alumina and combined with graphite for use in continuous steel casting and in exposed linings of metallurgical aggregates.

d) New Carbonaceous Materials

In conjunction with worldwide trends, development of the following is anticipated:

- flexible graphite for exposed seals in corrosive media in the engineering industry and in the nuclear energy industry;
- pyrolytic carbon for the electrotechnical industry and the radio industry and for the creation of functional and protective carbon coatings;
- glass-type carbon (for example, for use in medicine);
- fluorinated graphite and other special materials.

Although only a part of the subprogram is oriented toward totally new carbon materials, its inclusion in the program for new materials is justified because the majority of the materials proposed for solution has thus far not been produced in Czechoslovakia.

Current trends in materials research indicate that new materials will be characterizing future eras of development in human society, that they will determine the technical level of mankind, and that they will become the foundation for man's production forces.

However, to cover the development and production of new materials given the giant variety in their uses, is not currently even within the capabilities of large economies, let alone that of Czechoslovakia. The proposed program for development of new materials and technologies involved in their production and processing, thus, represents only that part of the materials for whose development Czechoslovakia has optimum scientific research, raw materials, production, and other prerequisites. Additional economically efficient support for the requirements of the Czechoslovak economy in terms of new materials will be possible only on the basis of effective international scientific-technical cooperation resulting in subsequent specialization or coproduction.

A concrete expression of this path is Czechoslovakia's participation in solving task No 4 of the priority direction of the Comprehensive Program of Scientific-Technical Progress of CEMA Member Countries Through the Year 2000.

Other basic prerequisites for the development of new materials in Czechoslovakia will include particularly the efficient preparation of their production base and the assurance of a broad amount of qualified information regarding their characteristics and conditions for use, particularly for designers, employees in the areas preparing production, technology, etc. Similarly, it will be necessary to deepen advanced school and postgraduate training in the area of mathematics, physics, and materials engineering.

AEROSPACE, CIVIL AVIATION

New Czechoslovak L-610 Passenger Aircraft Demonstrated

AU0302123189 Prague RUDE PRAVO in Czech 2 Feb 89 p 2

[CTK report: "New Czechoslovak Aircraft Presented to the Public"]

[Text] Uherske Hradiste—The Let enterprise in Uherske Hradiste-Kunovice displayed its new L-610 aircraft to the public for the first time on Wednesday [1 February]. Even the foggy weather did not prevent chief pilot Frantisek Srnec and his test crew from flying the aircraft, for its capabilities are up to world standards. The basic technical requirements for the 40-passenger aircraft were laid down in 1984, and work on the five prototypes of this model is currently in the final stages. The first aircraft produced in the series will come out in 1990.

The L-610 aircraft is meant to transport passengers on local routes, using airports with both artificial and natural surfaces. It can fly in difficult meteorological conditions. It has a roughly 26-meter wingspan, is 22 meters long, and can carry commercial loads up to 3,800 kg. Its flying speed is 400-490 km per hour, and it needs about 1,200 meters to land on a natural-surface airstrip.

The efforts of designers, workers, technicians, and management staff were appraised by CPCZ Central Committee Secretary Frantisek Hanus, who underscored the devotion with which they had succeeded in attaining their goal.

AUTOMOTIVE INDUSTRY

Bulgaria To Produce Improved Diesel Engines

AU1302175689 Sofia BTA in English 1614 GMT 13 Feb 89

[Text] London, February 13 (BTA correspondent)—The Dvigatelostroene Economic Association and the Perkins Technology Engineering and Consultation Company, an affiliate of the Perkins Group concluded an agreement according to which Bulgaria is to produce a new diesel engine. It will be with an improved ecological characteristics and will consume less fuel as compared with the ones which are produced at present in the country.

The engine parameters will meet the requirements of the world market for diesel engine for the next decade. Its basic application will be in load hoisting I.C.E. trucks in the production of which Bulgaria is a leading country.

The agreement envisages at the same time that Dvigatelostroene Economic Association and Perkins Technology would set up a company for research and consultation activities in other countries. In collaboration with Czechoslovakia Bulgaria would produce for the first time improved fuel-pressure pumps for the needs of engine production.

Business relations between the Bulgarian producers of diesel engines and the group "Perkins" date back to the first half of the 60's and according to the opinions of the British partners are developing well. On the other hand the BKC Limited set up here which is operating with Bulgarian capital delivers on the British market Bulgarian electric and I.C.E. trucks.

BIOTECHNOLOGY

CEMA Cooperation in Biotechnology Project

AU27012124 Sofia BTA in English 1459 GMT 27 Jan 89

[Text] Sofia, January 27 (BTA)—In partnership with the Soviet Union, the German Democratic Republic and Czechoslovakia, Bulgaria is participating in a sci-technical project of the Council for Mutual Economic Assistance for the development of biotechnological preparations containing microorganisms which absorb and

stockpile nitrogen. The purpose of the project is to reduce the usage of nitrate fertilizers in growing grain, forage plants and fruit trees. The specialists expect that the new technology will bring about an increase of 10 percent in the agricultural crops production and an increase of 20 percent in their protein content.

Status of Bulgarian Biotechnology Surveyed

Warsaw PRZEGLAD TECHNICZNY in Polish No 39, 1988 p 29

[Article by Keran Iwanow, director, Industrial Biotechnology Division, Bulgarian Biotechnological and Chemical Industry Association: "What is Happening in Bulgarian Biotechnologies?"]

[Text] A single institution, the Biotechnological and Chemical Industry Association, was recently assigned the mission of coordinating biotechnological affairs in Bulgaria. This guarantees that biotechnology will really develop under a single sponsor, not counting the scientific sponsors represented by the Bulgarian Academy of Sciences, the Academy of Medicine, the Agricultural Academy, and several other educational institutions having concerns in this area.

Bulgarian biotechnology may be divided into the following areas:
—Microbiological synthesis,
—Enzyme engineering,
—Technological bioenergetics,
—Genetic engineering,
—Ecological biotechnology, and
—Bioengineering.

For very understandable reasons, Bulgaria cannot afford to elevate biotechnology to a truly world level, but regardless of a variety of difficulties, the plans through 1990 do call for implementation of specific technologies and indicate the approximate production volumes in each of the six areas referred to.

Microbiological Synthesis

What are involved primarily are antibiotics for human use (among others the now traditional gentamycins, penicillins, and cephalosporins) and for use in veterinary medicine (tylosin, apramycin, avermictin, monensin, flavomycin, salinomycin, caricin, etc), and those used in plant protection (infimycin, lavendotricin, validomycin, etc).

The plans call not only for increase in production, development of new product technologies, and implementation of ones already created, but also introduction of new, so-called third-generation and fourth-generation antibiotics. In the same group of biopreparations as drugs are the amino acids, lysine, glutamate, aspartame, and protein hydrolysate from post-slaughter blood containing a wide range of amino acids.

New technologies will be created to increase the production of baker's yeasts and organic acids. There will be an increase in the amount of feed protein produced by means of bacteria (from products containing cellulose), methyl alcohol, etc. Bulgaria plans to use biotechnology to a greater extent than in the past in solving the so-called protein problem.

Experiments are currently in progress involving use of bacterial fertilizers in agriculture. The application of previously used insecticides is expanding, and entirely new pesticides are being developed, such as fungal insecticides and the like. Biological growth stimulators should also be mentioned.

Mention should also be made of the production of entirely new so-called biogenic stimulators used throughout the world in therapeutic and preventive medicine and in athletics. Original biopreparations deserving the attention of physicians will be Normoflor and Anabol (which is assumed to be anticarcinogenic) containing the microorganism Lactobacillus bulgaricus, that is, bacteria growing in Bulgarian yogurt. Lastly, this groups includes a biomass from seaweed produced in greater amounts than in the past and the medical, veterinary, and cosmetic preparations derived from it.

Engineering and Applied Enzymology

Industrial synthesis of so-called technical enzymes was mastered some time ago in Bulgaria. Emphasis is currently placed on broadening the range of enzymes—pectinases, proteases, amylases, beta-galactosidases, glucosooxidases, etc—and on producing a much wider mix of "extra-pure" enzymes used in diagnosis and analysis. Enzyme technologies are being introduced in the dairy, baking, beer brewing, and meat packing industries, and also in the detergent industry.

The construction of corn processing plants will begin at the end of this 5-year plan. By applying a special production process, these plants will be able to supply the food and pharmaceutical industries with more than 20 biological output products (such as glucose-fructose syrups).

Increase in the current output of "second-generation" enzymes is planned. They are so-called inactivated enzyme preparations. Thought is even being given to a "third generation" or synzymes (synthetic enzymes), which are not found in nature.

Industrial Bioenergetics

The Bulgarians are considering primarily implementation of a technology for manufacturing ethyl alcohol from waste cellulose through hydrolysis and secondary fermentation of the cellulose. The ethanol produced by this method is used not only as a motor vehicle fuel, but also as a raw material for many biopreparations such as proteins, amino acids, and antibiotics. An interesting

item of information is that a process for obtaining hydrogen and oxygen through biophotolysis of water particles has been developed in cooperation with Soviet scientists.

Genetic Engineering

The Bulgarian Academy of Sciences has now developed a technology for, and as a result of Bulgarian-Soviet cooperation it may be possible in the near future to produce interferon, calcitonin, and a growth hormone, among others. Technologies are now ready for manufacturing antibodies used in medicine and flower cultures (carnations and others) free of viruses.

Large-scale so-called tissue and cell cultivation of potatoes, other vegetables, fruits, and oil-bearing plants now appears to be entirely feasible.

Work is now in progress to develop special vaccines which may be used in market gardening and horticulture, medicine, and animal husbandry. Genetic engineering also includes cloning methods and diagnostic kits, for example, for early diagnosis of pregnancy in cattle. Scientists are also considering the possibility of transplanting animal embryos.

Ecological Biotechnology

This area includes primarily water purification by means of a so-called inactivated biomass, along with decomposition of waste and the no longer new technology of deriving biogas and organic fertilizers from it. It also includes enzyme purification of water which is especially heavily contaminated, bacterial "trapping" of metals, replacement of conventional pesticides with biopesticides, etc.

Bioengineering

The list of equipment used in biotechnologies is a long one. It includes both entire laboratories, industrial and pilot-plant fermenters, and various kinds of drying plants and equipment (spray driers, those with a layer of heaters, and lyophilizing driers). There are also separators, granulators, and microfiltration and ultrafiltration units, along with two-way osmosis systems and packaging and metering machines.

Increasingly wide use is made of electronics in this field, but biotechnology is used in electronics as well. The Bulgarians intend to manufacture biosensors, thereby taking the first step toward building Bulgarian-made biochips and biological computers.

COMPUTERS

Bulgaria, USSR, Finland Joint Computer Venture

AU2601084 Sofia BTA in English 0801 GMT 26 Jan 89

[Text] Moscow, January 26 (BTA correspondent)—Under documents signed here yesterday, partners from Bulgaria, the Soviet Union and Finland formed a joint venture called New Information Technologies. It will develop software products applicable in education, housing and public construction, in the social infrastructure and office work and will assemble personal computers. It will operate through branch offices in Bulgaria, Finland and the USSR (in Leningrad and Kalinin). Mr Rashko Angelinov, president of the Bulgarian Software Products and Systems Corporation, was elected chairman of the board of directors, and Prof Vladimir Tikhomirov (USSR) was elected chief executive officer.

It was emphasized at a news conference after the signing ceremony that the joint venture will promote the use of personal computers in intellectual labor. It is expected to contribute to meeting the demand for hardware and software. Feasibility studies showed that the venture can handle some 1,500 orders right away. Its business will be particularly promising if organised on a state-of-the art level. The new economic unit will be helped in this by the cost accounting basis on which it will function.

Under a contract signed here, New Information Technologies will take delivery of Bulgarian-made personal computers.

Bulgaria is represented in the joint venture by three subsidiaries of the Software Products and Systems Corporation. Between them, they take a 54-percent block of shares in the venture's founding capital.

CEMA Computer Products on Display at 'INFOSYSTEM 88'

23020032 East Berlin INFORMATIK in German Sep-Oct 88 pp 167-178
[Article by Klaus Fischer: " 'INFOSYSTEM 88' Exhibition"]

[Excerpt] Based on the success of the first "INFOSYSTEM" exhibition—which was held in Breslau—the primary sponsor, the management board of the Posnan International Trade Fair, decided to move this trade exhibition to Posnan. Therefore, "INFOSYSTEM 88," with exhibit space covering 10,000 square meters (including 3 000 square meters for foreign exhibitors), was held from April 25-28, 1988. It will also be held in years to come as a regularly occurring trade fair; it represents the only independent computer trade fair organized and carried out by a socialist nation. Compared to the first event, the assortment of exhibits was expanded to include electronic components and communications. The emphasis of the trade fair was on the following technical areas:

—Computer engineering, computer systems, peripheral equipment

—Office systems
—Transmission engineering, data transmission systems, electronic telephone exchanges
—Testing and measurement methods for the electronics industry
—System software and
—Electronic subassemblies

The participation of 240 exhibitors, including approximately 40 foreign exhibitors, is evidence of the impact and future viability of this international computer trade fair.

Display of Polish Computer Engineering

Polish industry provided a rather complete overview of its product range.

ELWRO—with 5000 employees one of the largest producers of computers in the People's Republic of Poland—displayed the various uses of the ELWRO 801 AT as the focal point of its exhibit (CAD/CAM station, desktop publishing, remote data transmission, administration, banking, local area networks). The use of Western peripherals in those ELWRO 801 AT configurations displayed was conspicuous. There was a special display, for example, which showcased the 801 AT connected to a wide variety of Mannesmann Tally printers. The 800 Junior schoolroom computer was displayed in a special exhibit hall. With its 64K of RAM and 24K of EPROM, this computer incorporates all of the features of a professional 8-bit microcomputer. It can be used in computer networks, and can therefore function as a terminal. It is the microcomputer which will be used until 1990 in all secondary schools in the People' s Republic of Poland.

MERA, the association of producers of computer equipment, automation and testing & measurement equipment—which includes 26 manufacturing enterprises, four scientific research institutes and two R&D facilities—displayed its entire range of products. Several important MERA enterprises are:

- MERA-Blonie, a manufacturer of terminals and printers, exhibited the new D-100 M dot-matrix printer from its D-100 series. This 9-pin printer has a printing speed of 50 characters per second. Additional technical features:

—Character sets: ASCII 96 with foreign language character sets as per FX-80, KOI-7 N0, KOI-7 N1, KOI-8, ISO Alphabet No. 2.
—Interfaces: Centronics (IRPR-M), IRPS, V.24 (RS 232C)
—Buffer storage: 4K
—Dimensions: 380 x 80 x 280 mm (W x H x D)

- At the MERA-Elzab exhibit—a manufacturing facility well-known for its Mera 7900 monitor system—the ComPAN/CM 1905.M1 8/16-Bit microcomputer was on display. This personal computer, based on the 8080 A/8088 microprocessor, has 512K of RAM, a 448K RAM disk and 10K of ROM. It uses the CP/M2.2 and MS DOS 2.1 operating systems. It can use the following programming languages: MACRO-SAM, C, AdA, BASIC, FORTH, FORTRAN, PASCAL and dBase II.
- MERAMAT exhibited its standard product line comprising reel- and cassette-type magnetic tape storage units and magnetic tape-based data collection and editing equipment, including the new PK 6 cassette-type unit which uses the standard ISO 8462 cassette. Other technical parameters of the PK 6 are a tape speed of 2.28 m/s, a data transmission rate of 90K bytes per second and a storage capacity of 45 MB (with the D C 300XL/P) and 60 MB (with the DC 600A).
- In addition to the manufacture of disk storage devices, era produces primarily mini computer systems. The era system was introduced at the trade fair. It represents a complex system which is used, among other things, to support scientific experiments. Depending on the area in which it is used, the system supports the most varied configurations which can be set up with the user on an individual basis, including the software used.

Software was also well represented among the Polish exhibits. The two largest manufacturers in the People's Republic of Poland, Zeto-Zowar (more than 300 employees) and Zeto-Breslau (approximately 400 employees), exhibited software for personal computers, CM computers and ESER-series computers. These products include software for automating management and administration, CAD/CAM software and medical software. Characteristic of both software manufacturers is that they take on the responsibility of planning and installing computer systems in enterprises and social facilities, developing the required specific software and performing maintenance and qualification tasks, all based on accounting methods and statistics.

The number of individual Polish exhibitors, some of whom have received foreign investment capital, was conspicuous. These are smaller manufacturers who complete their systems through the addition of modules which have been imported from Western and Southeast Asian countries, and who develop specific user software based on the orders they receive. These manufacturers are introducing modern technology to the Polish market (mostly compatible with the IBM XT/AT).

Robotron the Largest Foreign Exhibitor

The largest foreign exhibitor was the Robotron combine with a display area of 300 square meters. It exhibited products reflecting state-of-the-art technology and had its top-of-the-line 32-bit K 1840 computer on display.

The local area network Rolanet-I was introduced abroad for the first time in combination with this computer. In keeping with international demand—and also in accordance with the requirements of the Polish market—Robotron exhibited primarily complete systems, which utilize not only its own computers but also on its own peripherals and software. Therefore, in addition, a CAD-/CAM station, the BDS robotron A 5230 production data system and, for the first time abroad, the ZEUS A 5240 electronic timing and access control system were displayed and/or demonstrated. Robotron also again exhibited electronic typewriters. The display included the S 6130 standard electronic typewriter, the bilingual S 6131 memory typewriter and the Erika elektronik 3004.

Interesting Exhibits from Other CEMA Countries

In addition to the Robotron combine, ISOTIMPEX also had a large exhibit in which a broad range of products was displayed, including the CM 6411 plotter, the ISOT 1055 (a programming system based on a 32-bit microprocessor) and a CAD station. KOVO had two exhibits: The first exhibit was the DIGIGRAF 1208-4G, an automatic, programmable peripheral imaging device which can be used for creating drawings, pictures and graphics. The basic configuration is compatible with both ballpoint and fountain pens. The control system makes use of 8086 and 8080 processors. Data can be input via a 1/2" magnetic tape unit (IZOT), a disk unit or a computer equipped with a serial, parallel or standard interface (IRPR, V.24, IRPS current loop).

The new Consul 262.3 and 262.4 alphanumeric keyboards made up the second exhibit. These keyboards have non-contacting pushbuttons with integrated circuits. The keyboard codes are stored in a PROM.

Other CEMA exhibitors were VIDEOTON, with an information booth which offered the well-known personal computers and printers, and Cubaelectronica with a wide range of software, including medical software. Cubaelectronica also exhibited its PC 1715 disk drive and printed circuit board tester.

Chief of Largest Hungarian Computer Firm Optimistic in Interview

25020026 Budapest
COMPUTERWORLD/SZAMITASTECHNIKA
in HungarianNo 20, 5 Oct 88 pp 7-8

[Interview with Miklos Havass, director general of Szamalk, by Huba Bruckner, date and place not given]

[Text] Havass Miklos, the former programmer, has become the director general of one of the country's largest computer technological enterprises. At the beginning of our discussion he requests that we talk only about Szamalk. As we warm up, he discusses with increasing enthusiasm his work and plans. A devoted man, he considers his work his calling.

COMPUTERWORLD-SZAMITASTECHNIKA: It has been about two years since you were appointed the manager of Szamalk after the sudden death of Janos Juhasz. With what expectations did you start your work at the helm of a company by no means free of internal and external problems?

Miklos Havass: Indeed I was appointed to manage Szamalk on 8 June 1986 and was named director general, on the basis of a competitive application, on 1 December of the same year. I had definite plans concerning the role and duties of Szamalk which I had described in my application. I think I got the appointment to head the enterprise on the basis of these.

My plans remained essentially unchanged. In my opinion, Szamalk has three great tasks. On the one hand, it must remain in existence under the rather difficult economic conditions of today. On the other hand, Szamalk is a developmental enterprise providing a basis to the Central Bureau of Statistics. Therefore, we have to realize certain professional goals even if they are not truly economical for us. Thirdly, because we belong to a very receptive intellectual stratum, we think that it is also our calling to bring about new values which fundamentally define the sphere of motion of the Hungarian economy under the changing conditions.

We are simultaneously active in all three areas even if they contradict each other in a given moment. But the three are also closely built on one another. Everyday problems provide the short range tasks while for the third goal we have to circumscribe and influence the social and technical environment of the use of computer technology ahead for at least 10 to 15 years.

COMPUTERWORLD-SZAMITASTECHNIKA: Let us look at the everyday problems; how is Szamalk managing?

Miklos Havass: Our returns for last year amounted to 2.5 milliard [2.5 billion] forints, far exceeding all earlier figures. Our capitalist export was doubled within two years, last year we reached 130 million while this year's goal is already 180 million. Our 1987 profit is also a record, having been able to account for 130 million last year in contrast to the earlier 40 to 90 million per year.

Now we would be glad just being able to keep our management in balance. Because the changed regulatory system is causing us a loss of 150 million forints. If I compare it with the record profit of 130 million forints, it is obvious that repeating it would be an enormous task.

COMPUTERWORLD-SZAMITASTECHNIKA: What is the 150 million composed of?

Miklos Havass: It has many factors such as the grossing of wages because we have large excess wages; the compulsory price reduction mandated for some of our products; the withdrawal of all allowances heretofore valid

for every development enterprise. Beginning this year, we are not receiving a penny in state support in spite of the fact that we maintain a public library and we teach 8000 people per year. With the current hourly machine prices, the teaching costs are considerably higher than the income from the—by the way, increased—tuition fees.

Moreover, our situation is made even worse by the fact that teaching is tax free and, consequently, we cannot even pass on the AFA [expansion unknown] of teaching investment. In setting the tax rate, the state reasoned that those who teach receive compensation from the budget. They have forgotten the enterprises—such as ours—which perform important tasks for the state but they don't do it within the customary framework. In vain we called our problem to the legislators' attention, there was no longer a way to remedy it in the great haste associated with the tax reform.

COMPUTERWORLD-SZAMITASTECHNIKA: Under these conditions, how can the economic rentability of Szamalk be ensured?

Miklos Havass: Only by expanding the traditional structure with other computer technological and, more recently, with not directly computer technological spheres of activity.

Our computer sales have been expanded through new activities during the last two years. In addition to the sale of socialist-made large computers—by now considered a tradition—our place as assembler and manufacturer in the minicomputer category is also very significant on the domestic market. Although this is a new product, nevertheless, in the category of Mikrosztar type 32 machines, we control 70 percent of the Hungarian market. And we also sell a few thousand personal computers annually although we don't derive too much profit from these.

COMPUTERWORLD-SZAMITASTECHNIKA: You do these in the spirit of a complete range of supply?

Miklos Havass: Yes, that is one of the motives. At the same time it is our conscious professional policy decision that we don't want to compete with the small organizations on a plane where they are the strongest, that is, not in the area of the elastic acceptance of small tasks, but in large, complex tasks.

Increasingly, we want to accept work which requires at least 4 to 5 years of intellectual accumulation to be accomplished. Small enterprises cannot undertake such tasks if only because of a lack of capital. Our situation is different. We have many types of specialists and our activities range from hardware through software and organization all the way to teaching.

COMPUTERWORLD-SZAMITASTECHNIKA: And is it easy to get assignments of such large volume?

Miklos Havass: Regrettably, the current economic conditions do not favor large investments. However, the information systems are inevitably developing from the simple toward the increasingly complex. That is, after a given degree of market saturation with micro machines, it becomes a compulsive necessity to integrate these machines into a local network, to provide larger storage capacities and subsequently to set up large machine sources of power. These raise the necessity for divided data bases and for increasing the protection of data. We try to live up to this challenge. We also demonstrated at the Budapest International Fair [BNV] that in Hungary today we are the ones most capable of building the complex networks, of producing cooperation among the most varied types of machine.

Sale of machines and building of systems is only one component of the establishment of our economic balance. More recently, we have been having full scale export-import rights and thus we can also participate in international trade in fields other than computer technology. We think that we will also have some business in the tourist industry. We already own a hotel, and we are running a beer hall in Sopron.

COMPUTERWORLD-SZAMITASTECHNIKA: Does the guest know that he is drinking Szamalk's beer?

Miklos Havass: The "computer technological interest" in the inn has not yet become public. But we consider this restaurant a stable value in investment the more so because we want to use the rooms above the dining hall for computer technical programs. And the site is also very favorable from the standpoint of Austrian-Hungarian tourism.

COMPUTERWORLD-SZAMITASTECHNIKA: What professional responsibility is Szamalk burdened with as one of the country's largest systems enterprises?

Miklos Havass: Above all, that we should not be mere salesmen but should also perform authoritative developmental work. This is also a matter of a sense of vocation because it often contradicts our short-range economic interests.

When we set as our goal the development of modern user systems, we reckoned with the fact that these will not be adequately paid for on the market. Nevertheless, we think that what we do is a solid investment even in today's uncertain economic situation. We are accumulating an intellectual capacity which we will be able to sell profitably on an open market in the future. Teaching is also a similar activity; this is also not truly profitable but it will definitely bring returns on a longer range.

The acceptance of MAS-M and other, rather costly foreign know-how fits into this conception. We are sacrificing for these in spite of our awareness that the

structure, demands, preparation and financial possibilities of the Hungarian enterprises are by far not yet available today for their broad application.

We accept—if necessary even with initial operative losses—the development and operation of complex enterprise systems because we are convinced that they will be increasingly needed as the Hungarian economy becomes more and more connected with the international circulation.

COMPUTERWORLD-SZAMITASTECHNIKA: Could we hear about some examples of such high level intellectual creations?

Miklos Havass: We see it as important and are working successfully in the field of artificial intelligence; for the past two years, we have been intensively engaged in planning by computer; for the past year, in teaching by computer and this year, we have also established a laboratory for remote teaching. We are expending much money and effort on guidance information systems, and here we are involved not merely in the mechanization of static record keeping but also, increasingly, with dynamic production guidance. I can mention network development which we consider as more than the necessary hardware and software, we also include application policy and the problems of information utilization. We consider it important to develop economic models which will enable us to get information on what the structure of our economy should be, where to invest profitably and how the export structure should be shaped.

COMPUTERWORLD-SZAMITASTECHNIKA: It is my feeling that effective cooperation is the prerequisite for the success of the application systems mentioned and thereby also of Szamalk.

Miklos Havass: Yes, it is very good that you brought it up. I should like to stress that, compared to earlier times, we have completely new intentions for cooperation. We are open and would like to work together with everyone with whom we can produce results useful to enterprise groups or to the country. Proof of our sincerity is Multilogic, our recently registered enterprise, established jointly with SZKI [expansion unknown]. Its task is the development of various Prolog versions and expert systems and their sale at home and abroad. This enterprise of ours is an example that two large computer technological enterprises can also work together if they want to. As another example, I can mention Cellware Ltd., which was established earlier, where we are also taking on an active role in joint research and development.

COMPUTERWORLD-SZAMITASTECHNIKA: Does the establishment of Multilogic indicate that Prolog is expected to have an increasingly better future?

Miklos Havass: The truth is that there is rather great international interest in Prolog and especially its high speed version which can also handle time and, therefore, is suited for simulation, and also in the Prolog which uses transputers. We have to exploit it now, we have to work together and cannot wait to have the result be born several years later by—say—having only one individual work on a given problem.

COMPUTERWORLD-SZAMITASTECHNIKA: Are transputer developments also already in progress?

Miklos Havass: Of course, at the Software Tools'88 exhibit in England we already demonstrated the product named CS-Prolog. This is still only interpretative and, therefore, not too fast, but the other version too is already in preparation. At any rate, this is a unique product on the world today.

COMPUTERWORLD-SZAMITASTECHNIKA: What is the relationship between Szamalk and its clients?

Miklos Havass: Actually we don't consider them simply as clients but as partners suitable for long-range cooperation. We have such relationship with the Budapest Transportation Enterprise [BKV], Chinoin, Ikarus and the Hungarian State Railroads [MAV], Mahart, the State Farm in Nagyatad, Videoton and a list of others.

We work primarily for large enterprises and organizations, and our 32 bit Mikrosztar machines are indeed capable of solving larger, complex enterprise problems. We consider our work successful if an harmonic cooperation develops between the user and the developer.

COMPUTERWORLD-SZAMITASTECHNIKA: The export-import activities of Szamalk are already a matter of international cooperation. What are the guiding principles of your trade activities?

Miklos Havass: We carry on the second largest capital, intellectual export trade in computer technology. We consider the quantity achieved to be important, the more so because it is derived from basically intellectual products. But a change in structure is our definite intention also in this area. Our goal is not simply the marketing of Hungarian knowledge but the sale of semi-finished or finished products on the capitalist market.

COMPUTERWORLD-SZAMITASTECHNIKA: We have great traditions in "human trade." But what is the situation with the sale of products? Are there things to be offered at all?

Miklos Havass: Previous Hungarian experiences also prove that it is difficult to find the idea which will be marketable in the end. We have to be acquainted with the customs, user environment and forms of trade abroad. This cannot be done from the distance, market reports are needed, and that is why we have representatives in various cities of Europe. We think that we can be successful on the market with semi-finished products which we can then change in accordance with user demands at any given time.

In other words, we should like to establish an increasing number of "incubators" in the West. I mean, we would more-or-less work out the good Hungarian ideas at home and would subsequently make them ready for the given market jointly with the specialists aroad.

COMPUTERWORLD-SZAMITASTECHNIKA: Could we have an example of such an incubator?

Miklos Havass: We have made many medical diagnostic expert systems. For example, this knowledge could be popularized by producing a portable unit that the general practitioner could carry with him on his rounds in the country just like—say—his blood pressure apparatus. Feeding into the system the data of his screening examinations in the given districts, he could get information on who is healthy and who requires further medical examination.

Such a product, for example in the United States where people are very sensitive to their state of health, probably could become successful. But this must be made so that not only its inner content but also its outward appearance and other characteristics be compatible with local taste and regulations. Therefore, this also requires a cooperating partner abroad.

COMPUTERWORLD-SZAMITASTECHNIKA: This "artificial health guard" is very interesting but it seems a little utopistic. Are there products currently available which could count on certain success also on the Western market?

Miklos Havass: Yes. One is—let us say—Softdoc which can be used for automatic software documentation and error correction. Until now this has been successfully marketed in German-speaking areas. It could certainly be marketable also in Anglo-Saxon countries but for that a variation corresponding to the British and Americal style must be prepared.

COMPUTERWORLD-SZAMITASTECHNIKA: What is the situation with machine trade, how are the ESZR computers selling on the changing market?

Miklos Havass: According to our philosophy, we continue to buy large machines from the socialist partners even if there is a significant decrease in demand temporarily. This can be explained primarily in terms of investment problems. We are thinking in various constructions. We are working with the individual countries on ways to bridge the conflicts derived from pricing. We are establishing joint enterprises and joint trade actions. I consider it important that we ourselves also take the reliable functioning of the machines very seriously and present the ones arriving from abroad to the buyers only after a longer tryout period. As a result of this, one of my greatest source of pride is that, since I have been director, court litigations involving hardware ceased and our clients are more satisfied. Except for the price, which they consider high, this, however, is a technical matter involving Hungarian foreign trade.

COMPUTERWORLD-SZAMITASTECHNIKA: It is obvious to us that you are striving to build the future of Szamalk and, of course, of computer-technological applications according to a well considered conception. You have already mentioned that you like long range planning, moreover, that you consider it your vocation and Szamalk's obligation.

Miklos Havass: It is indeed my opinion that the third large task of Szamalk is precisely "the preservation of values." I consider it a preservation of values because today, in Hungary, the use of computers is not a compulsory requirement in very many fields. Few factories would stop functioning if their computers would break down. In the more open Hungarian economy of the future, computers will already be indispensable. It is our very great and responsible task to support the Hungarian economy in this opening process.

We profess that we must become an organic part of Europe also in the field of computer technology, with all of its consequences, also including the varied, legally clear associations. Among others, we want to halt the illegal distribution and copying of software. This is important also because we want to buy and sell on the software market the same way as any other country of Europe. The distributor contract signed with Microsoft is part of this conscious software trade policy of ours; with the exception of DOS, we alone sell their products.

COMPUTERWORLD-SZAMITASTECHNIKA: Does that mean an exclusive right?

Miklos Havass: Yes. But such relationships already exist not with them alone. Similarly, we are the authorized and exclusive teaching center for Novell. (Its importance perhaps does not even need to be stressed in view of the overwhelming global success of the Novell networks.)

I have mentioned our association with Hoskyns with respect to a long-range transfer of know-how; or our joint enterprise established with the Hemingway company. I could continue the list, we are engaged in forming numerous joint enterprises and in building novel partner relations.

COMPUTERWORLD-SZAMITASTECHNIKA: Before the war, Hungary had very close relationships with large international companies, for example Siemens and Philips. Is there any hope for reviving these relationships or, if necessary, for rebuilding them?

Miklos Havass: We are firmly resolved to do so because thereby we can develop new, very strong bonds with Europe and with the world. We should like to work together with Siemens, Olivetti, IBM and ICL. But we have similar goals toward the socialist enterprises, for

example, we are tightening our bonds with Robotron and ELWRO in the GDR. We would like to establish numerous foreign-Hungarian joint enterprises with headquarters in Hungary or abroad. The advancement of Szamalk is characterized by the appearance of satellite enterprises and by their increasing role.

We want to expand our presence with consignment warehouses, by now we are in charge of such matters involving BASF, Dataco and Honeywell.

COMPUTERWORLD-SZAMITASTECHNIKA: And do we have enough specialists who speak foreign languages for all that?

Miklos Havass: Foreign language studies have a good tradition in Hungary. But in order to strengthen our European relationships, we need specialists who are capable of negotiating in a foreign language. Therefore, we are attempting a difficult task; we are starting computer technological education in the French and German languages. The realization of our plans is supported by the French and German cultural organs and also by universities abroad. Teaching in French will already be started this autumn. We are also discussing the taking over of educational materials.

COMPUTERWORLD-SZAMITASTECHNIKA: Noting the conscious intention of Szamalk to build international relationships, the question arises inevitably whether it is also engaged in building a similarly close relationship with specialists in Hungary.

Miklos Havass: Of course, we consider it very important that, in the current, difficult economic period, the young technological—computer technological—intelligentsia as well as the group of economists and social scientists see a sensible goal. We should like to consciously influence them and prepare them for the economic unfolding. Therefore, we are holding top-management courses and decision conferences, and we are organizing a seminar entitled "For the Development of the Technical Intelligentsia" within our enterprise. We are inviting professionally authoritative colleagues and social scientists as speakers and debaters.

But we also want to participate in the retraining of the unemployed, we are offering scholarships to high school graduates, we educate them and we organize part time jobs for them in certain factories. Thereby we prepare them so that within two to three years they could get jobs as middle ranked workers in the computer technological industry.

I could also mention our undertakings as sponsors, our summer camps providing cultural and sport facilities, and part of our "social impact" in the broad sense is the remote teaching now under development. There also is talk about a joint effort between our remote teaching office and other domestic organizations to develop the methodological fundamentals of various retraining projects,

COMPUTERWORLD-SZAMITASTECHNIKA: How much help is provided by the collective of the enterprise toward the achievement of the plans, in general, has Szamalk become a unified team by now, because we know that the merger was opposed by many both within and outside of the enterprise?

Miklos Havass: It is not sufficiently unified even today, but if I look at the process, signs of increasing unification are apparent. My opinion can also be confirmed by our external partners.

It is my expressed wish that my coworkers form their opinions freely and independently because many healthy initiatives could arise from this. I am very glad that an increasing number of well known experts have joined us during the past two years.

Polish Computers, Peripherals on Display at Poznan

23020030 East Berlin RADIO FERNSEHEN ELEKTRONIK in GermanNo 10, 1988 pp 670-671

[Unattributed article: "60th International Fair at Poznan 1988"]

[Excerpt] We visited the International Fair in Poznan, in order to learn on the spot about the present capability of the Polish electronics industry. In order to keep up with the international development in electronics, on the one hand cooperation with Japanese, English or FRG companies is intensified, but on the other hand there are efforts to make domestic scientific activity more efficient. Some interesting new developments will be presented in the following.

Last year the booths of large, medium-sized and small companies offering their services for computer technology were located harmoniously next to one another, but this year the exhibit area was more reserved for the major companies. The reason for this is to be found in the "Infosystem," the special fair for the computer industry, which since last year takes place annually in April. The numerous private and semi-private software, consulting and service companies will have their eyes more on this specialized fair and expect more action from it.

As a further development of the Mazovia 16-bit personal computer, Mikrokomputery Ltd. presents the Mazovia 2016 AT, which also has a processing width of 16 bits and multiuser capabilities. It is based on the 16-bit CPU 80286 by Intel, supplemented by the 80287 coprocessor, and works with a clock frequency of 6 MHz and 10 MHz, respectively. The RAM capacity includes 512 Kbytes and can be expanded. The two diskette storage devices

have capacities of 360 Kbytes and 1.2 Mbytes, according to the expansion level. To this is added a hard-disk drive with a capacity of 40 Mbytes (optional: 20 Mbytes). At the same time the company offers an EGA color monitor and the MM 12 P black-white monitor for the CGA and Hercules screen modes, a keyboard and the NX-15 (Star) and D 100 PC printers for use with the computer. To connect them, two RS-232-C and one Centronics interface are needed.

The newest equipment from Mikrokomputery Ltd. is the 32-bit workstation computer PC 386, whose production has not yet begun. It is conceived as a "tower." The basis is the 32-bit CPU 80386 by Intel, which works with a clock frequency of 16 MHz or 20 MHz. 1 Mbyte is specified as RAM capacity, expandable to 8 Mbytes. The basic equipment further includes two floppy disc drives with a capacity of 1.2 Mbytes and 360 Kbytes and a 40-Mbyte hard disc drive, a 14-inch monitor, which uses the CGA and Hercules graphics modes, as well as a keyboard. As options, an EGA graphics card, the ST-4096 80-Mbyte hard disc drive, the ST 251 40-Mbyte hard disc drive, the Streamer FT 60 with a capacity of 60 Mbytes, installation of a 80287-16 coprocessor, the NB 24-15 printer, the RP-1200H modem and the Rolland DXY 880 plotter are being offered.

Meraster Katowice demonstrated its local Meranet network, using the Mera 660 and Mera 680 personal computers. The Mera 660 functioned as the master computer. In technical data and performance capability the Mera 680 resembles the Mera 660, only it was conceived as an auxiliary computer and is used as a slave computer. Meranet enables the coupling of up to 64 computers. Coaxial cable with a characteristic impedance of 50 Ω was used as a transmission medium. The local net works according to the CSMA-CD access principle, with a transmission speed of 2 Mbit/s. Parts of the basic equipment are a transceiver (media line unit) with transceiver cables and two LAN controllers LAN/V24 and LAN/Q, each of which has an 8-Kbyte receive buffer memory and a 4-Kbyte transmission buffer. If data transmission takes place asynchronously to or from the master computer with the LAN/V24, the transmission speed is 9,600 bit/s. The information exchange between the LAN/Q and the slave computer is undertaken in direct memory access. The local Meranet network is suitable for automated office work, for laboratory automation (CAMAC and IEC-625 interfaces) and for CAD-CAM tasks.

The RSWSTER (Silesia) personal computer, also shown by Meraster Katowice and compatible with the IBM PC AT, is based on the 16-bit CPU 80286 with the 80287 coprocessor. It works with a clock frequency of 10 MHz. A capacity of 4 Mbytes is indicated for the main memory. In addition, it contains a 40-Mbyte hard disc memory and an floppy disk drive with a capacity of 360 Kbytes and 1.2 Mbytes. The monitor utilizes the EGA graphics mode. A multifunction card provides an RS-232-C and a Centronics interface, as well as a clock. A 60-Mbyte streamer and a communications card are offered as options.

Mera Blonie is expanding its printer assortment with the DT-2408 thermal printer. It has a printing speed of 240 lines/min, and the character generator can be loaded with a maximum of 256 characters. Various character fonts are possible, such as normal, wide, script, indices as well as letter-quality print. Depending on the fonts, 70, 80, 98 or 140 characters can be printed on one line. It has a 4-Kbyte character buffer. The power draw is 80 W; measurements 390 mm x 392 mm by 135 mm and it weighs 12 kg.

The TD-103 KSR and TD-104 V terminals can be used for local or remote data transmission. They work according to the matrix printer principle, with a printing speed of 140 characters/s. In the text mode the character matrix consists of 9 x 10 or 9 x 11 dots, and in the graphics mode 18 x 44 dots. The ASCII and CRT character set as well as national characters have been implemented. Text can be printed normally, expanded, boldface, compressed and underlined, and in addition there are possibilities for semigraphics and graphics. According to the choice of printing, a line may contain 5, 6, 6.66, 8.25, 10, 12, 13.33, or 16.5 characters per inch. The spacing between characters can be programmed in steps varying between ½ and 1/12 inch. Both units have a 16-Kbyte character buffer. The TD-103 KSR terminal also has a noncontacting alphanumeric and function keyboard. The power draw is 70 W; the measurements 415 (580) mm by 4465 mm x 150 mm (TD-103 KSR); it weighs 12.8 (14.8) kg (TD-103 KSR).

The MIXS modular multiprocesssor computer system can be adapted for many special application purposes and demands. The central, 16-bit microprocessor module enables an additional 16 microprocessors to cooperate via a joint bus system, in which each microprocessor module also has a local bus. This module contains a 16-bit CPU K 181 BM 86 (8086), which has 8087 and 8089 coprocessors and a 64-byte ROM. A 32-Mbyte adress space can be reached through the 1041 bus system, as well as 1 Mbyte through the local bus. The floppy disc controller module is capable of controlling a maximum of eight 5.25 or 8-inch diskette drives, and has its own intelligence in the CPU Z 80. The memory capacity of the system DRAM module is 512 Kbytes. Its access time is an average of 300 ns (maximum 540 ns). It is connected through the system bus. In contrast, the 128 Kbyte DRAM module is connected to the local bus. It achieves an access time equal or greater than 470 ns. The interface modules are also connected to the local bus. They contain, on the one hand, four serial interfaces of type IRPS, RS 232 C and TTL, and on the other hand two parallel IRPR interfaces. One module is intended to control the MM 16.A1 graphic display, another for the MM 16.A1 or MM 12.A12 graphic displays. The facility is supplemented by a keyboard with 138 keys, a serial interface and the possibility of connecting a mouse, by the mouse itself and a power supply unit.

FACTORY AUTOMATION, ROBOTICS

GDR Training in Flexible Automation Outlined

23020023 East Berlin FERTIGUNGSTECHNIK UND BETRIEB in German No 10, 1988 pp 597-600

[Article by Dr W. Sommer, KDT, Ministry for Universities and Technical Schools, Prof S. Wirth, KDT, Technical University Karl-Marx-Stadt: "Training and Continuing Education in Flexible Automation in the GDR"]

[Text]

Introduction

At the 11th Socialist Unity Party (SED) Congress it was resolved that computer-integrated factories be gradually established during the next decade.

Starting out with the premise of this task and the experiences gained so far with the implementation of the 1983 "Resolution on Modifying Training and Continuing Education of Engineers and Economists in the GDR," this paper presents some thoughts on flexible automation.

1. Development Trends towards CIM-Operation

Mastering flexible automation at the highest level, i.e. computer-integrated, automated production—also called CIM—is the basis for the establishment of such factories. The gradual development of processes and whole factories affects all areas of the plant reproduction process from complex operations and production planning to design, technology, quality assurance, manufacture, transport, transfer, and storage processes as well as sales including accounting and statistics. Figure 1 illustrates the individual functional areas within a plant, showing how the information they provide is interrelated.

Flexible automation of the direct material production process must be accompanied by an increase in the efficiency of areas related to production preparation, an item which receives high priority. The time required for managing, organizing and implementing processes such as development, design, material procurement and planning of the manufacturing process have increased steadily, so that in machine construction, for instance, more than 50% of the total time is spent on order processing.

This is due to the fact that to a large extent, all processes shown in Figure 1 still take place one after the other and not in a synchronized manner.

Computer-integrated production must not be viewed as a simple chaining of processes and tasks; rather, these tasks and processes must be integrated and interrelated and their timing must be synchronized in order to achieve more effective product manufacturing [1]. This leads to new considerations regarding the information structures within the plant. Figure 2 contains the three components which must be taken into consideration in a CIM-plant. These include:

—order-related
—product-related
—production-related components.

These components form a 3-axis coordinate system with the material production process at the intersecting point. Given the necessary hardware and software, all three components can be accessed via an integrated database.

The complexity of the tasks shown in Figures 1 and 2 clearly indicates the difficulties in qualifying cadre in the area of flexible automation and ultimately CIM. Engineers are required both for individual CIM-components and for integrated tasks of plant-wide factory automation, i.e. for developing and planning the system and increasing its efficiency, for the control, monitoring and safeguarding of production.

As part of the intensified training in information technology which started in 1981 and which is being developed gradually, CAD/CAM training for specific areas was increasingly stressed in particular in mechanical engineering.

In the design-oriented disciplines, students are trained in CAD-technology, in disciplines with a technological orientation they are trained in CAP and to some extent also in CAM areas.

Starting with the academic year 1986, 15 percent of the students in the technical sciences will be trained so that upon successful completion of their studies they will be able to develop applications software for a specific field or branch, introduce and train users in information processing systems for computer-assisted projecting, design, economic and technological preparation and control of production (CAD/CAM systems).

Including the order-related (PPS) and product-related component into the systems approach according to Figure 2 requires both training in the CAD/CAM areas and a systems engineer who must be trained and receive continuing education in the subject matter and methodology relating to the development of complex system solutions with different levels of automation up to and including the automated factory [2].

2. Duties of the System Engineer

Looking at the information flow in Figure 1 it would certainly be helpful to have an engineer who is proficient in all areas of computer-integrated manufacture from preparation in the areas of design, projection and technology to the planning and implementation of the manufacturing process. However, the cost of such a training cannot be justified. What can be justified is a reasonable distribution of tasks based on actual conditions and depending on the engineer's area of expertise. We must

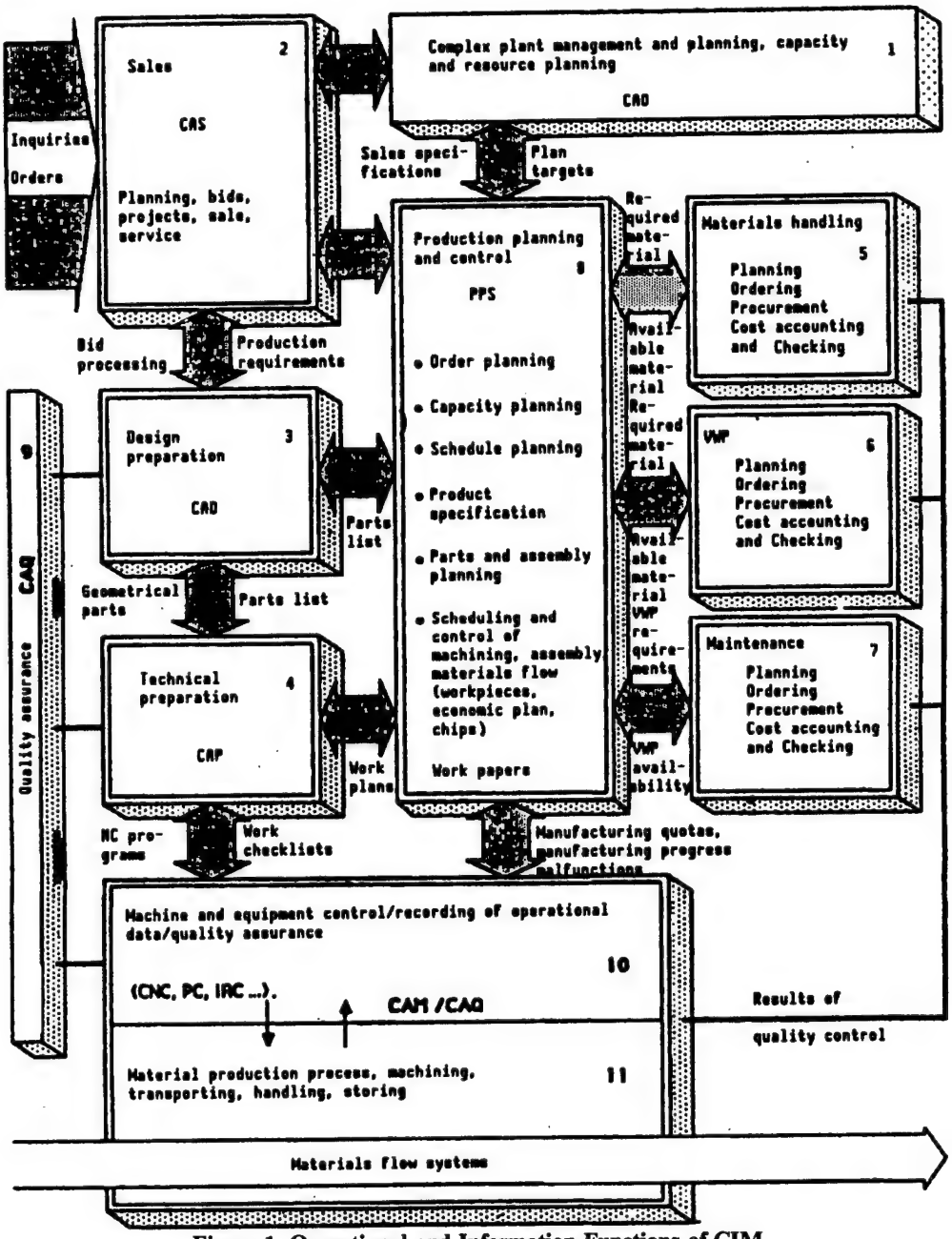


Figure 1. Operational and Information Functions of CIM.

continue to have cadre-specialists who prepare and implement the individual technological processes and the specific process of handling and processing. On the other hand, we need a technically trained person for organizing and operating production processes for the whole plant. The organizer and operator of production processes for the whole plant must project, operate, control and maintain the whole technological production process consisting of a multitude of different individual processes as well as of main, auxiliary and secondary processes. The main duties of a system engineer for factory automation are:

—Interrelating the information flow via production process control on the following levels: planning and disposition of manufacturing, technical control of equipment and machines as well as

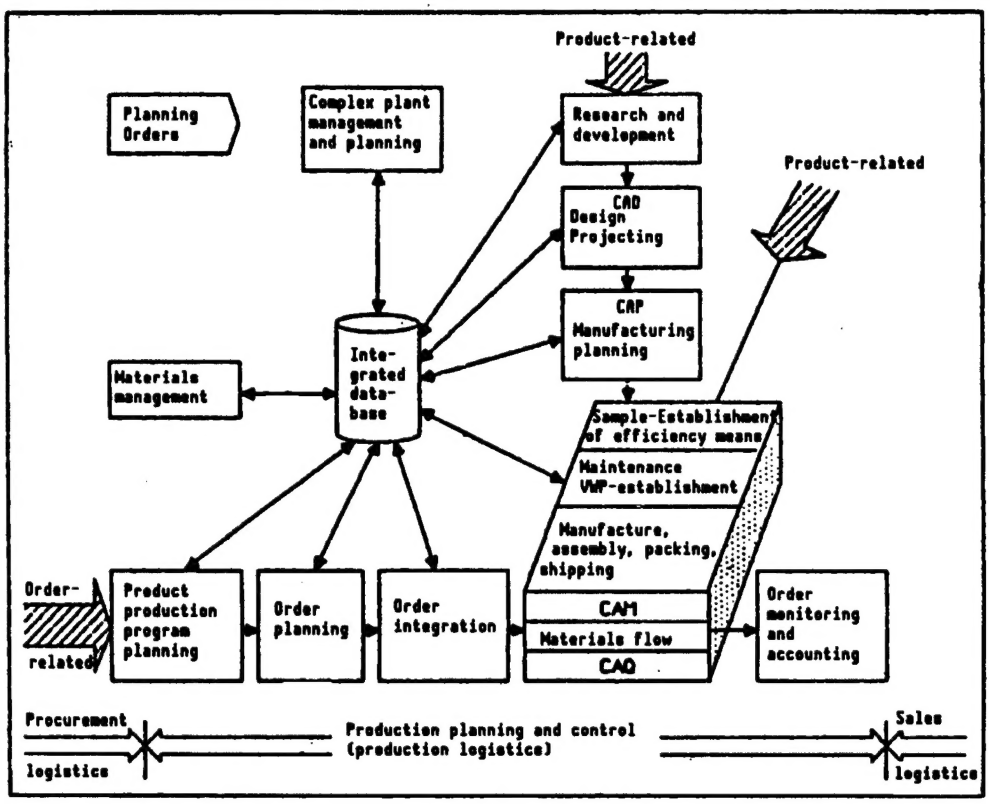


Figure 2. CIM Components Relating to Ordering, Product and Production.

—Interrelating the materials flow between manufacturing locations (machine tools, machining centers, manufacturing cells), manufacturing groups, sections and areas of parts manufacturing and assembly.

Production process control is that part of production organization which deals with the planning and control of manufacturing orders using appropriate materials and information flow solutions primarily in the production implementation phase.

In the factory with mixed automation, the uniform and consistent handling of the material and information flow as well as production preparation and implementation of all so-called flow systems is of particular importance. Here, production process control as an information processing method must use the lastest findings of information science. A specific information processing method for production processes will develop.

Based on the proven training of the plant manager in the GDR and in view of the development outlined, the following concepts can be derived:

- The engineer for factory automation must continue to have a solid knowledge base, skills and expertise in the field of production technology and organization. He must be familiar with and be able to use the manufacturing methods, manufacturing technologies and the equipment as well as the technologies and equipment of all flow systems, in particular of the materials and information flow. Based on a scientific analysis of the work he must project, operate (organize and control) and maintain the production process and related installations.

He must be familiar with the more general flow systems.

He must become qualified for conceptual and design work in order to connect the interfaces such as inventory, transport, delivery, handling and processing.

- Thus, managing production processes as a whole requires a system engineer who is better trained to think in terms of production systems of various sizes, automation and function. He must be able to handle the cybernetic methods of system analysis and synthesis, system performance test and system evaluation, and he must be sufficiently familiar with them so that he can use them for the practical management of the interfaces between different production units and flow systems.

- Since this engineer is primarily responsible for organizing and operating the production process he remains primarily an expert in technology, but still

must be taught the basic concepts of information technology and information science to a greater extent than previously. An information scientist who has some technical knowledge is no solution for industry. Here, too, the following principle applies:

First, the technical content and the overall procedures of the production process must be organized, then the information processes must be modelled and programmed, and only then should the information processing operations be automated, and not vice versa.

In this respect, computer technology geared to the production process will always remain a tool for the technical expert. Targeted training in information science should concentrate on skills and expertise for

—Computer-assisted developing of concepts and projecting of CIM-plants, production facilities and parts thereof (e.g. manufacturing systems) and

—Computer-assisted production process control.

The graduate must be able to select and operated information, communication and control systems for a specific production process.

Technical centers which teach the essential CIM components are important prerequisites for training and continuing education. Such a technical center was established at the Technical University Karl-Marx-Stadt [3].

It contains comprehensive materials and information flow solutions which have been implemented with computer control from inventory to the automatic assembly cell. All functions and processes are coordinated and monitored by the computer-assisted control center. Here, both hardware and software use the level concept. This technical center—and the GDR has similar laboratories in other educational institutions, e.g. the Technical University of Dresden—serves as a research and training center. In addition, it is responsible for conducting preliminary research for industry and for preparing software solutions ready for implementation. Important components of this technical centers were transferred to industry, e.g. the automation project ABT 12 of the plant division Thum in the VEB Machine Tool Combine "Fritz Heckert" Karl-Marx-Stadt.

3. Training and Continuing Education in Flexible Automation

3.1. Direct Studies

The training of a system engineer is based on a broad basic education in social sciences, mathematics, natural sciences, design and technology, electrical engineering and electronics. Application-oriented information regarding laws pertaining to social sciences, business administration and mathematics and physics are taught to a greater extent. In addition to a solid training in manufacturing technology, he must have a thorough knowledge of information science, automation and control technology as well as measuring and sensor technology. For designing flexible automation systems, he must have skills and expertise in cybernetic concepts, system design, communication and artificial intelligence. Specialized training involves the teaching of technological projection of computer-integrated partial and complete production systems with emphasis on technical-organizational solutions for materials flow (materials flow technology), information flow (production process control), energy and media flow (supply and disposal) as well as for maintenance, work, health and environmental protection. Selected areas such as the design of automated production systems, CIM-factory structures, factory planning, work organization, organization and control of the investment processes and economics are integral parts of training. Training in software development for production planning and control as well as production logistics (order processing, procurement and sales logistics) have a high priority.

The specialized training covers the development and application of CAD/CAM-solutions for flexible manufacturing and production systems using CAD/CAM and production procedures.

3.1.1 Training of Technical Personnel

The increasing use of flexible automated manufacturing systems and complete manufacturing areas involves a restructuring of the relationship between man and machine. The process of differentiating the work content results in new areas of responsibility which require the use of a technical expert on location.

Starting in 1988, technical personnel will be trained for automated manufacturing with the following objectives:

- In the area of production preparation

—Analysis and organization of manufacturing processes and partial processes in the metal-working industry for the technical preparation of automation solutions

—Contributing to the implementation and testing of new, integrated and automated manufacturing systems

—Contributing to the definition of the technical means required for automation and determining the requirements these means must meet

—Contributing to the development, adaptation and routine running of required software

- In the area of production implementation, planning and control

—Start-up of new automated manufacturing systems

—Operation of manufacturing systems and management of small manufacturing sections

—Helping in developing maintenance and troubleshooting strategies (monitoring strategies)

—Troubleshooting in case of hazards (identifying error location, error cause, error effect, and others)

—Assembling and disassembling manufacturing systems requiring few operators, NC and CNC controlled machine tools
—Implementation of error diagnoses and error prevention.

3.2 Continuing Education

Short-term training of workers which is related to the permanent restructuring of existing plant structures is particularly important in the planning and implementation of CIM-plant structures. Preplanned CIM solutions can only be introduced effectively with the deliberate, creative cooperation of the workers. The increased qualification of the workers which becomes necessary requires modular training and education concepts for practically every new level of factory automation in a five or seven year cycle. The cost of this training is increasing continuously [4]. Figure 3 shows an example of the changes of the qualification expenditure from the NC machine to the CIM concept. The broad knowledge the workers must receive can only be taught through continuing education. For this purpose, the following concepts are suggested which need close cooperation with industry:

- Post-graduate studies (systems engineer) for:

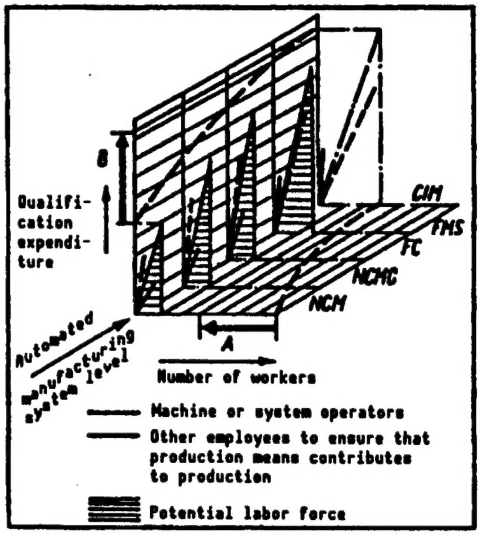
—CIM plant structures (system planning, projecting and implementation)
—Production process control (procurement, production and sales logistics) and control software
—Control and communications systems
—CA-technology (CAO, DAD, CAP, CAQ, CAM)
—Maintenance of materials solutions
—Complex plant management and planning

- Continuing education seminars for automation engineers, mechanical engineers and economists:

—Qualifying the automation technologist for CIM-relevant problems in mechanical engineering
—Qualifying the mechanical engineer for CIM-relevant problems of system, automation and control technology
—Qualifying the economist for CIM-relevant problems of complex plant management and planning including increasing administration efficiency.

- Short seminars for individual CIM components

—CIM concepts (overview)
—CAO,CAD, CAP, CAQ, CAM
—Production planning and control (method and overview)
—Operational and software systems



A. Reduction in the number of employees with comparable manufacturing volume
B. Increase in the qualification expenditure for employees versus comparable manufacturing

Figure 3. Changes in the Qualification Expenditure.

—Control and communications systems
—Work force structures in a CIM plant
—Projecting, implementation and operation of flexible manufacturing systems
—Managing tasks and training as well as other tasks.

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